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ENGINEERING AND MINING JOURNAL

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A Weekly Journal of the Mining & Mineral Industries — Largest Circulation of any Mining & Metal Journal in the World

Upper Silesia, the Mineral Treasure Land Contested Between Germany and Poland

German-Polish Contest for Upper Silesian Mineral Riches

by John E. Orchard

Who Owns the Earth?
by J. E. Spurr

Applying the Blue Print Round
by C. H. Waters

Jackhammer Type Drills in Witwatersrand Mines
by E. M. Weston

Editorial
The Geologist as Engineer

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THE times require of men charged with public responsibility a singleness of purpose. The curse of the present is the almost universal grasping for power in high places and in low, to the exclusion of the discharge of obligations. It is always well for men to walk humbly.
—*Governor Calvin Coolidge of Massachusetts.*

The Geologist as Engineer

AN ENGINEER, in the modern sense, is one who applies the principles of abstract science to practice. Researches into the exhaustless treasure-fund of unexplored knowledge, with no aim other than the furthering of the truth, are amply justifiable and profitable from the most materialistic standpoint, for there are few truths that do not find some practical, money-and-time-saving, production-creating use in the everyday business of life.

As science along many lines has been more prominent in the recent decades than at any other time in the history of mankind, it follows that the engineer, as an important factor in practical affairs, is typical of the same period.

In an old dictionary (Webster, 1887) we find engineering divided into military and civil. As a further division, mechanical engineering is noted, as well as steam engineering, hydraulic engineering, gas engineering, agricultural engineering, and topographical engineering. Mining engineering is not mentioned, nor are many other modern phases, which we know as sanitary engineering, chemical engineering, efficiency engineering, and even economic engineering and human engineering.

The mining engineer is a product of the nineteenth century. The earlier miner was a mechanic rather than an engineer; although skillful, his work was based upon experience rather than on the application of theory. To him came as a competitor and prospective superior the scientist, with his knowledge of the principles of mechanics, of chemistry, of physics, of mathematics. The newcomer, doubtless clumsy and not sure-footed at first, was not highly regarded by the practical miner; but the application of his theory swiftly made him the more practical man of the two, and mining and metallurgy were given up more and more exclusively to his guidance.

The geologist of the early part of the century, intent on the great fundamental problems of the science, on the discovery of the principles of erosion, intrusion, the succession of strata, and the studies in biological development associated therewith, scarce seemed to have any direct contact with practical affairs. With the further progress in these and other branches, however, each and all have been found to have a practical application, and the development of a type of geologist who has specialized as geological engineer, studying and applying the principles of the science to industry, has been rapid, until today there exists a numerous and important profession.

Most notable has been the development of the geologist who specialized in mining problems, and further specialization has taken place into metalliferous deposits, coal, oil, and non-metalliferous (as commonly so called), and even into quarrying. Regarded at first by the mining engineer (himself just newly arrived) with the same collegiate upper-class man contempt which the miner had accorded to him, the geological engineer in mining has won all the recognition due him and has taken his permanent place in the industry. Meanwhile, the geological engineer is also finding fields of usefulness in railroad and bridge, dam, subway, and other engineering work, in problems of water supply, road-building, land classification, and even in military science and problems of governmental policy.

The geological engineers at present far outnumber the geologists, much as the mechanical engineers outnumber the students of mechanics and physics. The affiliations of the geological engineer are naturally mainly with other engineers; the geological engineer specializing in mining has affiliated himself with the mining engineer, and has, indeed, become one of the varieties of mining engineer into which specialization has led; and is so recognized. His main field of development, so far as it depended on organization or association, has been in the Institute of Mining Engineers, the name of which organization, in deference to the progressive specialization, has been recently changed to the Institute of Mining and Metallurgical Engineers, and we understand would have been the Institute of Mining, Metallurgical, and Geological Engineers, except for the unwieldiness of the name. At present the presidents of our two great mining societies—Winchell and Lindgren—are both geological engineers.

Upon the organization concerned with unapplied geology, the Geological Society of America, the geological engineering profession has leaned less and less, while keeping a watchful eye on it for any advance in the science. The society, indeed, has not accorded adequate recognition to the geological engineer, whom it has esteemed but lightly; and it is as a result of this that the active element of this society has become predominantly collegiate. It is curious to note, as a concomitant of this, that the teaching and dissemination of geology in the schools and colleges has fallen away sadly at the same time that geology was becoming a part of the chosen study of every mining engineer.

The U. S. Geological Survey and the state geological surveys have naturally developed into so many corps of geological engineers, with a resulting lack of any great common interest between these institutions and the Geological Society of America, and a stronger affiliation between them and the mining engineers, the hydraulic engineers, and others.

In recognition of the existence of the profession of

geological engineer, a journal was established to cover this field about fifteen years ago—the journal of *Economic Geology*. This journal has a thousand subscribers, and is international in its circulation. No separate organization, however, has been formed to group together the geological engineers or to distinguish between geological engineers and geologists. Quite recently a subgroup of geological engineers, the petroleum geologists, formed an active organization, several hundred strong; and an arrangement has been made between this organization and the journal of *Economic Geology*.

Apparently the time has come when the profession should be given the benefit of the advancement which comes with organization and definition. Moreover, it is time that the public and other engineering professions should be protected against the sailing under false colors (as a geological engineer) by the engineer who is not a geologist, and the geologist who is not an engineer (in the true sense, as above defined). Representatives of either of these classes, by assuming a role for which they have not been educated and trained, may seriously injure the standing of a now solid and scientific profession.

To the mining industry this organization will be a great benefit, insuring a more active progress in the knowledge and practical application of mining geology. Standards of membership will doubtless be established, so that full members may be assumed to be competent, so far as training and experience go; and, perhaps, an outer group of junior or associate members will receive the benefits of association, and eventually pass into the fully qualified group. Thus those seeking the services of geologists will not blindly pick either a mine surveyor or a professor of paleontology, eager for the fee which the geological engineer earns. The mine surveyor or the paleontology professor may be invaluable for solving certain economic problems; but in that case he will be called in for consultation by the geological engineer as a physician calls in a bacteriologist.

Such an organization would buttress the American Institute of Mining and Metallurgical Engineers, as members of the new organization would doubtless in nearly all cases be members of the Institute, and it would give new life to the Geological Society of America by the reactions between the two.

The Metal Quotations of the McGraw-Hill Publications

WE HAVE ENCOUNTERED a certain feeling that the McGraw-Hill Publishing Co., which publishes the *Engineering and Mining Journal* and ten other publications, and which, through its allied company, the McGraw-Hill Book Co., is the largest publisher of technical books in New York, is allied with "Wall Street and the Trusts," and that the metal quotations in the publications of this company are controlled by the great metal-producing companies.

In view of this, the discovery which we have just made is amusing: We find that, of three of the technical journals published by the McGraw-Hill company, the *Engineering and Mining Journal, Chemical and Metallurgical Engineering* and the *Electrical World*, all of which publish New York metal quotations weekly, no two agree. For example, on Jan. 6, the *Electrical World* quoted copper 19@19¼c. and tin 63.25c. On the same day the *Engineering and Mining Journal* quoted copper 18.85@19.10c., and tin 61½c. *Chemical and Metallurgical Engineering* on Jan. 5 quoted copper 19½c., lead 8.00c., zinc, East St. Louis, 9.27½c., and on the same day the *Engineering and Mining Journal* quoted copper 18.85@19.10c., New York lead 8.45@8.55c., and zinc, East St. Louis, 9.35c. Comparisons on other dates are correspondingly dissimilar in nearly all cases.

Certainly, we must exonerate the McGraw-Hill company of systematic collusion with anything or anybody, even with itself, in the past; but in the future *The Journal* will try to secure a greater uniformity of metal quotations among these different journals at least. Quoting the metal market is not an exact science, but is an approximation which requires investigation, balancing, and judgment; and it is believed that *The Journal* has the most complete sources and the best methods for accomplishing this. We purpose in the near future to discuss this problem more explicitly.

$6,000,000,000 Needed For American Railroads

THE mining industry, and those industries which are its natural complements and allies, must do their part in the rehabilitation of the railroads of America if a threatened crisis—perhaps a repetition of 1873—is to be avoided. Co-operation should take dual form: first, insistence that our representatives at Washington bestir themselves and agree upon railroad rates and control; second, investment of surplus and reserve funds in new transportation issues of approved safety and assured and equitable return.

The experts of the editorial staff of the *Railway Age*, in the issue of that journal of Jan. 2, maintained that to meet the industrial needs of the United States new railroad investments totaling $6,010 000 000 will be required in the next three years, and this estimate has been confirmed by the executive heads of many important systems.

The transportation interests will need for 1920, 1921 and 1922, according to the autnority quoted, 6,000 miles of new line, 10,850 miles of automatic block signals, 13,177 locomotives, 15,000 miles of multiple main tracks, 30,000 miles of side and yard tracks, 24,500 passenger train cars and 712,400 freight cars. These replacements and additions will cost: additional main track, $1,250,000,000; grade division, cut-offs, elimination of curvatures and similar work, $600,000,000; engine houses and shops, $250,000,000; station buildings, $300,000,000; extensions, $600,000,000; signals, $52,264,000; freight cars, $1,662,000,000; passenger cars, $532,000,000; shop equipment, $61,230,000; locomotives, $702,786,000—a total of $6,010,280,000. The statistics are here set down to make apparent the great interest that the basic industry of mining has in supplying raw materials for the needed equipment.

The dependence of all industry on transportation demands no emphasis. Unless the carriers have equipment with which to move the freight offered (and they have not), there must be slowing up or complete shutdown of those industries lacking transportation facilities. The reconstruction period presents no more pressing problem than the refinancing and reorganization incident to the return of the roads to private ownership on March 1. There are 933 fewer miles of railroad in the United States today than at the beginning of 1917. New construction is 933 miles behind abandoned

track. Earnings are stated to be $400,000,000 a year below normal.

Labor in general cannot be fully employed or efficiently productive if whole districts are without adequate transportation facilities to move the goods which industry, under normal development, would produce—and areas so affected are increasing in number daily.

Interwoven as they are into the warp and woof of all trade, business, and industrial development, if the railroads of the country are deteriorating in service, equipment, replacements, and general operating efficiency, there must ensue an inevitable depression at the very time of greatest need for maximum production. High prices, industrial unrest, inflation, and currency depreciation all flow in some measure from the restraints imposed on industry by a national railroad system that has been whanged and banged about by the state commissions, by the Interstate Commerce Commission, by theoretical tinkerers and experimenters, and by Congress, until owners and managers are fairly exuding pessimism and despair. On top of which, the railroad brotherhoods clamor for still higher wages.

No plans for reorganization and extension can be made unless and until Congress acts. And Congress, with characteristic dilatoriness, appears not to be able to decide just what form railroad legislation shall assume. Rates must be raised materially, or a government subsidy, or guaranty, must be provided. Whichever expedient is adopted, the people must pay. It is plain, however, that a government subsidy would imply more rigorous and perhaps hampering official checks and restraints than would probably be considered needful under a system of unimpeded corporate development. Members of Congress should be urged to expedite the work of that body in framing and passing railroad legislation as to rate-making and method of control. There seems to be a cow on the track—or is it a flock of mules?

On Dec. 30, 1919, the National Shippers Conference memorialized the Conference Committee of Congress against the provisions of the so-called Cummins Bill (H.R. 10453) which provides for the creation of a Transportation Board, and opposed a form of guaranteed returns and the appropriation by the Government of surplus earnings, favoring the retention by the Interstate Commerce Commission of the powers that it formerly exercised. Considering the fact that the Interstate Commerce Commission was, before the war, by no means a popular public body, the explanation of the attitude of the shippers would seem to be that they prefer the commission, despite former criticisms, to a board the powers and personnel of which would be unknown quantities. The American Mining Congress is on record as indorsing the position of the National Shippers' Conference.

Vast plans are being made for extension of long-time credits to Europe. Stupendous financial commitments are needed by the carriers. The country has plenty of money, but until uncertainty as to rates, the method by which they are to be established, and the function of regulatory power is cleared up by definite and reasonable national legislation, neither banking institutions nor individuals will be attracted to the securities of transportation corporations. The strain of industrial readjustment already on the banks will soon be further increased by credits to prevent a complete collapse abroad.

Once Congress acts, and it is possible to make plans for the needed revivification, *The Journal* believes that it will prove to be sound financial policy to have new issues of the respective systems underwritten, so far as is practicable, by the banking institutions of those parts of the country through which the roads run. Much of the great sum required might well be supplied by the people and industries of communities served by the roads. By investing in new transportation issues the surplus and reserves of the industries through whose patronage alone the railroads can prosper, and which themselves exist only because of the transportation facilities provided by the roads, a mutuality of interest would be effected which would serve to unite interdependent industrial factors in such a manner as to promote a realization of the fact that injury to one essential and basic industry ought to be the concern of all the people, and particularly of those upon whom rests the responsibility of maintaining on a sound basis the business of the country.

High Cost of Mining

In a previous editorial we analyzed this question, and with reference to this the following more recent analysis by the manager of the Commercial Research Department of Swift & Co. is of interest:

"High prices are not due to profiteering. They are due to three principal causes: First, an abnormal demand for commodities, caused by the ability of the masses to buy as they never have before; second, a world shortage of commodities, caused by the war; third, increased currency and credit facilities, reducing the purchasing power of the dollar."

It will be noted that in our analysis we did not cite the high cost of labor as the reason for the high cost of living. This was a milestone in thought that was passed several months ago. As a matter of fact it is not a fundamental factor. The question as to whether the high cost of labor is responsible for the high cost of living or the high cost of living is responsible for the high cost of labor is akin to the discussion as to which was first, the hen or the egg. We are of the opinion that the vicious circle was started by the rise in prices due to causes to which we have before referred, and that this started the increase in the cost of labor, which then had its influence, with other and major causes, in inducing inflation.

We are not in sympathy, therfore, with those industrial physicians who believe that the remedy for all industrial unrest is to explain to labor that it is receiving 80 per cent of the profit and production on all enterprises, leaving only 20 per cent to management and capital; and that of this 20 per cent four-fifths is reinvested in machinery and plants for further production, thereby offering labor a further opportunity. It is believed by these physicians that, after this is explained, labor should be convinced that if it will adopt the policy of increasing production, rather than decreasing it, all troubles will be solved. These statements are true, and the advice is sound; but they will not appeal to the working man, whose cost of living has gone up faster than even his wage increase, so that he finds himself poorer than before. If he gets 80 per cent, but has not enough for his living expenses, it interests him very little whether it is 80 per cent or 10 per cent. He wants to find the way out—the way out and up, and as he is not in charge of the conduct of the business he looks to those who are in charge to find the way for him. When they fail to do so he may even

as a last resort, sometimes contemplate, (even if not seriously), trying to run the business himself.

Therefore it behooves those in charge of business, who are really the moral guardians of labor, to acquaint themselves with the real reasons for rising costs, in order that they may be in a position to advise a corresponding remedy.

The first thing in any industrial cure is to diagnose the disease properly.

The Depreciation Of European Currency

OUR financiers and economists are slow to recognize the fact that the currency of all the late European belligerents has depreciated to a marked degree. The persistently declining rate of exchange between these countries and the United States has been assigned to the balance of trade, to the fact that we were exporting much more than we were importing. The fact, however, that this decline has been marked only in the case of those countries who have exhausted their resources and credit through the war, and that the decline is proportionate to the relative known amount of exhaustion, shows clearly that the drop in exchange is mainly due to depreciation of currency. For example: the Austrian crown, the gold value of which was 20.3c., has declined to 0.36c.; the shrinkage of paper as compared with gold is 98 per cent. The German mark, with a value of 23.8c., has shrunk to a value of 1.24c., a shrinkage of nearly 95 per cent. The French franc, with a value of about 19.3c. gold, has shrunk to about 7.52c., a shrinkage of 61 per cent. England, financially the strongest of these exhausted nations, has had a shrinkage per pound, worth in gold $4.86\frac{6}{8}$, to $3.50\frac{1}{2}$, a shrinkage of 27 per cent.

Compare these figures with those of the non-belligerent European countries. Spain, whose peseta was worth 19.3c. in gold, has an exchange value of 18.24c. to the peseta, a shrinkage of only 5 per cent. Spain kept well out of the war, and was not involved in it. Holland also kept, to the best of her ability, out of the war, but, surrounded on all sides by belligerents whose finances were to a certain extent interlaced with hers, her finances suffered somewhat. However, her florin, worth 40.2c. in gold, has a present currency value of 37.75c., a shrinkage of about 5 per cent. Note, however, Denmark, a little country, which was practically the vestibule to Germany and whose finances are largely controlled by German capital. Her krone, worth 26.8c. in gold, has a present currency value of only 16.90c., a shrinkage of 38 per cent.

In general it is clear, as shown above, that the low exchange rates are due to depreciation of currency and government credit. The persistent fall of these exchange rates is a most ominous sign for the financial structure of Europe.

The British premium on gold is also a clear index of conditions. Today gold is worth in British currency about 50 per cent over its gold weight value, and is being bought largely at that figure by Americans. In other words, the gold ounce, whose value is 77s. $10\frac{1}{2}$d., is being paid for at 117s. paper currency; which is equivalent to paying $3.24 in United States currency for this paper pound, but full value ($4.86\frac{6}{8}$) for the gold pound; so that the gold stands at what is termed a premium in London at 50 per cent. It will be noted that the depreciation of British paper as measured by the gold bar is running ahead of that as measured by the exchange, the balance for which is mainly, but not entirely, payable in gold sovereigns.

These conditions are quoted as relative to the United States money, perhaps the most stable existing standard. They illuminate the conditions in our own currency, as in the United States we are also suffering from inflation, even though to a less degree; and the high and rising scale of prices, regardless of the supply, stock or production of gold shows that our currency has very much depreciated from the gold standard. The absolute depreciation of European currency is therefore greater than the above figures.

A clear conception of these conditions is manifestly necessary before a remedy can be fixed upon and judiciously applied.

Canada's Government Railways

WHEN the plan for the nationalization of the Grand Trunk Pacific Railway has been ratified by the stockholders (and the project is practically certain of approval) Canada will have approximately 24,000 miles of government-owned railroads. Some interests in the United States are pointing to this fact as an evidence of a progressive spirit which we in this country should emulate. The subject is one which should interest every mining man, for approximately 58 per cent of the total originating tonnage of our railroads comes from our mines and oil wells.

The plan being followed in Canada did not arise from dissatisfaction with private ownership, or from a demand that state control be tried. In fact, it may be said that Canada has taken over this enormous mileage against her will. The late Sir Wilfrid Laurier, about fifteen years ago, had visions of the marvelous development which Canada might experience, and, as a result of the part that the Canadian Pacific had played, thought that nothing would hasten the fulfilment of his dreams like a vast network of railways. Accordingly, legislation was introduced which made possible the extension of the Canadian Northern to the eastern provinces and the prolongation of the Grand Trunk across the prairies and mountains to the western coast. Sir Robert Borden and others maintained that a much better plan would be to connect the systems then built by means of a comparatively short line across the waste country of northwestern Ontario, thus, along with the Canadian Pacific, making two transcontinental systems instead of three. But Laurier's ideas prevailed and had the overwhelming support of the public, which reasoned that the new railroads would duplicate the success of those already built.

From the first, the new construction required government aid in the way of loans and guarantees of the railway companies' bonds. The Canadian Northern, and, later, the Grand Trunk Pacific, became such constant applicants for government loans that the public refused longer to be charitable, and in 1914, in return for the moneys advanced up to that time, assumed a 40 per cent interest in the Canadian Northern.

The government really had its choice of three courses: (1) a continuance of the enormous loans of from ten to twenty millions a year; (2) liquidation of the roads; or (3) government ownership. The public would no longer sanction the first procedure, especially after the

initiation of European hostilities, when every cent was needed. The second choice would have meant almost complete loss for the investors, many of them British, who had lent financial aid to the projects, and it was fully understood that, if this were allowed to occur, the country would be put on the financial blacklist for a long time. So the third course seemed the most advisable, and as a result Canada finds herself the owner of practically all of the country's railways except those owned by the Canadian Pacific, and this, too, without having any special predilection for government ownership. That the government will extend its plan by acquiring the Canadian Pacific is just about as likely as that the C. P. R. will take over the government. It is thus evident that advocates of the Plumb plan, or any other system of national ownership, can find little support for their arguments in Canada's policy.

Although such extensive mileage through undeveloped country is now a considerable hardship for the people, the time will come, and sooner than many think, when the railroads will not only be self-supporting but will increase to a great degree the wealth of the country. A railroad may not pay expenses, and yet may be of great economic benefit to the country as a whole. The vast natural resources of the Peace River country, of the Mackenzie basin, and of northern Ontario have scarcely been touched. Think what that comparatively insignificant Ontario government-owned line, the Temiskaming & Northern Ontario, has done in opening Cobalt and Porcupine. Although much of the Hudson's Bay country is covered with muskeg, there are any number of opportunities for the exploration engineer.

The Problem of the Educated

WE TAKE great pleasure in publishing in this issue a very thoughtful letter from P. B. McDonald, in which he discusses some of the possible reasons why technical men are underpaid.

The old idea that a man is paid for what he knows, and not for what he does, must, under present conditions, be somewhat modified. Are there too many educated people in the world today and too few in the ranks of the untrained? Is a trained man who feels above doing manual work less important than the mechanic? Should disagreeable work that does not require brains be more highly paid than clean, skilled work? We do not think so.

Possibly the problem can be solved by more technical graduates going into the mills and shops. There they would get a higher wage, and at the same time, by decreasing the supply of trained men for office work, would improve conditions for the men who chose to remain at desks. Technical men are needed in manual lines, a fact which was impressed on our mind when inspecting the work of a plumber in our kitchen.

One objection to the foregoing plan is that, in certain cases, such trained men would be obliged to join one of the much criticized unions in order to get manual work. As the policy of some of these unions is to kill individual effort by preventing the ambitious worker from doing more than the lazy man, a trained man would have little, if any, advantage.

In the course of time the old law of supply and demand will run true to form. If paper hangers are paid more than pharmacists, to use Mr. McDonald's simile, there will be something about paper hanging which will make it worth more, otherwise more men would take up the trade and bring the wages down.

We are inclined to think that the present ruling reason why the artisan receives more money than the artist is because the latter is unorganized. If the surveyors, for instance, all over the country rose en masse and insisted on salaries commensurate with their ability and training, their demands would be granted in short order, for their services are indispensable. And yet, as pointed out by Mr. McDonald, independence and individualism might be sacrificed.

In this connection it may not be generally known that even now there is a union of technical men in this country known by the somewhat elaborate title of "International Federation of Technical Engineer's, Architect's and Draftsman's Unions," affiliated with the A. F. of L., with about 5,000 members, including representative divisions of civil, mechanical, electrical, and other varieties of engineers. Wage scales have been formulated, and conditions have already been considerably improved for many of the members, notably marine draftsmen. A similar organization in Great Britain has 50,000 members and the French-Italian union of "Organized Talent," has more than 33,000 members.

Possibly the high class of men of which such organizations are formed will enable them to avoid much of the reprobation now hurled at the labor unions.

The Magnesite Tariff

A CORRESPONDENT in our "What Others Think" Department comments on our "Magnesite Tariff" editorial in our issue of Jan. 3, and is of the opinion that our view should be more definitely stated. We respond to the interpellation. We do not believe that any tariff should be imposed if the American magnesite can compete without it with the foreign magnesite. We believe that the American magnesite industry should be protected by a tariff sufficient to allow it to compete with foreign magnesite, and survive with a fair margin of profit. We believe that the tariff should be made sufficiently low so that foreign magnesite can compete with American magnesite. Concerning what the amount of the tariff should be we see no convincing data. The cost of European magnesite delivered in America is yet an uncertainty; and the cost of producing American magnesite has not been satisfactorily fixed. Moreover, the respective fields of refractory brick manufacturer and consumption should be taken into careful consideration. Before the development of the American magnesite industry the refractory plants were naturally situated along the Atlantic seaboard; with the establishment of this industry, plants will probably be located in the middle states, nearer what we are informed is the center of consumption. This would give a natural advantage to the Western magnesite in the Middle States; and to the foreign magnesite in the Eastern seaboard market.

We are therefore opposed to hasty action. At present, we understand (as in the immediate past), that the American industry is not suffering from foreign competition.

The great problem, for all mining interests and others, at the present moment, is Europe's threatened financial and commercial collapse; and until that is adjusted—if it be possible—we are not in favor of passing tariff laws, which would tend, even if ever so little, to aggravate the situation.

WHAT OTHERS THINK

Trained Men at a Discount?

A good deal of thoughtful comment is being made to explain why the man trained to a highly specialized kind of work is faring less well financially than the untrained man. For instance, a correspondent of the New York *Evening Sun* asks why a paper hanger, a man of indifferent skill armed only with a brush and pail (not much training or equipment certainly), receives $7 for eight hours of work, whereas a pharmacist, who probably devoted several years and several thousands of dollars more to his training than did the paper hanger, receives less pay for longer hours of work involving at least as much responsibility as the pasting of paper on a wall. F. H. Newell likewise asks why civil, mechanical, and electrical engineers, particularly those employed by railroads, are being paid at the same rates as prevailed fifty years ago, when the purchasing power of the dollar was three times greater. During that fifty years the wages of unskilled labor, or at least very little skilled, such as shovelers, trammers, street sweepers, and window cleaners, have increased astonishingly.

For years the young men of the country have been advised by captains of industry and men of eminence to train themselves so that when asked by an employer "What can you do?" they can answer "Survey" or "Analyze ores" or "Direct this or that." Judge Gary, of the U. S. Steel Corporation, has said: "The present is the age of the specialist—the man who can do one thing well." Yet it is a commonplace that most "specialists" are underpaid, though nearly everyone knows of many instances of fortunes being made by storekeepers, jobbers, milk distributors, candy makers, restaurant keepers, and unnumbered others, who really are not specialists, because perhaps a year or so ago they were in some other enterprise—perhaps tending bar or selling aluminum ware.

Sifted down to the underlying idea, the question might be put thus: Should skill and brains and training be paid less than mediocrity and haphazard enterprise? If so, then there is no wonder that the condition of industry is unstable and confused, with leaders and ideals and discipline sadly lacking. If the man of education, of specialized ability, and of steadfast principle is to fare worse than the man who lacks those characteristics, why should people continue to strive for them?

Milo S. Ketchum, who, under the general supervision of D. C. Jackling, directed the construction of the town and the huge smokeless powder plant of Nitro, W. Va., during the war, was approached by a young engineer who asked for a job among the thousands of men employed there.

"What pay would you expect?" asked Dean Ketchum.

"At least twice a carpenter's wages," replied the engineer.

"You mean half a carpenter's wages" was the decision.

Afterward Dean Ketchum explained this policy of half pay for the college-trained man by remarking that, though the engineering graduate gets a small salary in his twenties, he has a good chance to earn a large income by the time he is forty or fifty, whereas the carpenter's pay is about the same at twenty-five as at fifty. In other words, the young engineer is paid partly in hope and expectation—even though he has spent four years preparing himself for a specialty. Suppose, however, that the hope and expectation are inadequately fulfilled, as it is natural to imagine is the case (witness the middle-aged engineers doing unimportant work in any large drafting room). In such cases, the carpenter would still be ahead! It does not seem altogether fair on the face of it. All engineers cannot make a huge success to repay for the years on half wages. Yet all carpenters get union wages—good carpenters and bad carpenters; and not a few carpenters have the hope and expectation of making a fortune at contracting or building or storekeeping.

Professional men, it is agreed, should not commercialize themselves to the extent that many merchants and business men do, or there would be little work done for patriotic and unselfish reasons. Research and the human element would be largely lost. Many professional men shy at organizing themselves in the manner of labor unions, and maintain that the professions would lose sadly if independence and individualism were blotted out. Yet what is to be done to obtain justice for the trained man and to put economic conditions on a healthier basis? If skilled work and ability are to be adequately rewarded, just how shall it be done?

It might be suggested if the pharmacist, engineer, or specialist sees more money being made in paper hanging or street sweeping or storekeeping, he is at liberty to engage in those callings, and that, according to the classical Adam Smith, demand and supply pay a man what he is worth. But there must be pharmacists, engineers, and other professional workers. Some one would have to do their work. An exodus from the class of specialists would hardly benefit the community. Besides, men trained by years of working and thinking according to the requirements of a specialty are usually unfitted for unskilled or commercial undertakings.

Some engineers of high rank have intimated that the chief reason for small salaries is the overcrowding of the professions. Without putting it in so many words, they suggest that too many young men choose engineering who should enter paper hanging or storekeeping. It would be interesting to know how many eminent engineers believe that.

On the other hand, educators are advising young men to get an engineering education as a general preparation for life. A training in applied science, they argue, is good for almost any active young American who has not chosen such a dissimilar calling as the ministry, medicine, or law.

Possibly a conference of leading representatives of capital, labor, and agriculture, such as President Wilson convened for a consideration of wages and general eco-

nomic conditions, could do something to relieve the trained man, if it were given the proper support and were allowed any real power. The difficulty lies in the lack of political influence by unorganized professions, as in the most political country in the world, organized and forceful representatives usually win the important prizes.

The professional men wish to wield political influence and yet not organize in such a manner as to take away the independence of the individual member. They hope to achieve some measure of success by stating their case, appealing to the general sense of justice, and making known by indefinite propaganda what are the duties, responsibilities, and rewards of the trained man. If this is to be a successful "age of the specialist," as Judge Gary calls it, the trained worker, whether he works with his hands or his brain, should be rewarded for raising himself above the ranks of unskilled and irresponsible labor. P. B. McDONALD

New York, Feb. 2, 1920

Crystalline Gold and Tellurium

I would like to ask you if you know of any explanation of the causes and conditions leading to the formation of crystalline gold in quartz. For the past fifteen years I have noticed tellurium is found to be associated with the crystalline form of native gold without exception, so far as I know.

An English gentleman was once showing me the photo-engravings of a number of gold specimens from various districts of Australia, and among them I noticed some that were crystalline, and I remarked that there was tellurium where they came from. He disputed this at first, but upon my insistence that if it had not been discovered it would yet be found, after reference to the reading matter accompanying the illustrations, he admitted that I was right, saying:

"By George, you're right. Those specimens came from West Australia, where they do have tellurium."

May I suggest that the crystalline form of native gold is a pseudomorph from calaverite, presumably. If this is not admissible, will you please give or refer me to a better explanation of the cause of that form of native gold in quartz. WILLIAM H. WASHBURN.

Santa Cruz, Cal., Jan. 14, 1920.

The Mexican Problem

I read with much pleasure your editorial "The Mexican Problem" in the Dec. 27 issue of the *Engineering and Mining Journal*, and wish to congratulate you on the frank, sincere, and clear manner in which you treated the subject. I assure you that the conclusions you offer are inevitable and conform to those of the vast majority of observing Americans who know Mexico.

If a statement of facts and policy as asserted in your article had been made and acted upon by the President of the United States a few years ago, it would have saved thousands of lives and unmentionable suffering and sorrow to the Mexican and American people alike.

I have followed the Mexican situation carefully, and will state that your editorial is the first public utterance that I have observed which really makes any clear suggestion as to what should be done and in a general way defines the purpose and manner of procedure.

For one, I wish to offer my appreciation, and trust that the next President of the U. S. A. will be gifted with sufficient executive ability to utilize the experience, observations, and advice of Americans of your type.

Copper, Cal., Jan. 15, 1920. JEROME H. HILBERT.

Magnesite Tariff Bill

I have read your interesting editorial in the Jan. 3 issue of *The Journal* in regard to the magnesite tariff bill. A hearing was held by the Senate Committee on Finance on Jan. 6, 1920, in which some interesting information was brought out in regard to this subject. I am under the impression from reading your article that the subject matter at the hearing of Jan. 6 was not in your possession, for otherwise I think your conclusions would have been somewhat different.

An expert of the principal opponent of the bill testified at the Jan. 6 hearing that dead-burned magnesite could be produced at the plant of the Northwest Magnesite Co. for $13.55, and, if depreciation and depletion is included, $14.51 would be the actual cost of producing dead-burned magnesite f.o.b. cars Chewelah, Wash. The transcontinental freight to the Atlantic seaboard is $16.06, giving a delivered price on the Atlantic seaboard of $30.57, so that without profit the Northwest Magnesite Co.'s dead-burned magnesite would be exactly competitive on the Atlantic seaboard with Austrian magnesite if the latter could be sold at $30 per ton. However, the price at which Austrian magnesite can be sold is wholly a matter of conjecture at this time, at least according to the testimony given before the Senate committee. It was testified, for instance, that about 7,500 short tons have been brought in since July, 1919, at a cost, as near as can be determined, of $35.25 per net ton on board vessel, Atlantic ports.

The Northwest Magnesite Co. claims that its plant cost approximately $772,000. I understand that the company has a capacity of around 100,000 tons a year, so that if it has an indicated profit of $8 to $9 per ton, based on an estimated selling price of $45, as you mention on page 3 of your Jan. 3 issue, it would have an entire return of plant investment in one year's operation. Considering the amortization which may have taken place during 1917, 1918 and 1919, and the company's profits during those years, it would certainly have a handsome investment. Would it not be better to consider the return to which it is entitled on its plant investment and place this figure even at 20 per cent, or $154,400 per year, or $1.54 per ton, and in this way obtain the proper amount to furnish the company protection under a tariff?

Your article is based wholly on the selling price on the Atlantic seaboard, and if you will consider that the geographical center for the use of dead-burned magnesite as a refractory material is probably on the Ohio-Indiana state line, you will see that the freight question enters largely into the subject. For instance, the freight rate to Chicago is $12.87, against $16.06 to the Atlantic seaboard, whereas the freight from the Atlantic seaboard to Chicago is $7 per ton, so that for consumption of dead-burned magnesite in the Chicago district, which is a large user of this material, the Washington product would have a $10.19 advantage, in addition to any advantage offered by tariff protection.

This all leads up to the last paragraph on page 3 in the Jan. 3 issue of *The Journal*, in which you state that you are disposed to favor the proposed tariff, which I

think would be interpreted to mean that you favor the $15 per ton tariff rate. It may be that you simply meant to state that you were disposed to favor a tariff which would give protection to an American industry, but not a tariff which would return 100 per cent on the investment yearly.

It seems to me that a protective tariff on new American industries should be placed at such a figure that it will invite, we will say, imports to an amount that will control the price of the domestic product. The $2,000,000 tax per annum is, as you state, not much to the ultimate consumer, but if it meant $2,000,000 annually to one company, with a plant investment of $772,000, it seems to me that it is a price which the public should not be called upon to pay.

I am placing this information in your possession so that you might, if you wish, explain your position a little more fully in the matter of the protective tariff bill on dead-burned magnesite now before Congress.

F. F. COLCORD.

New York, Jan. 24, 1920.

Flow-Sheet Conventions

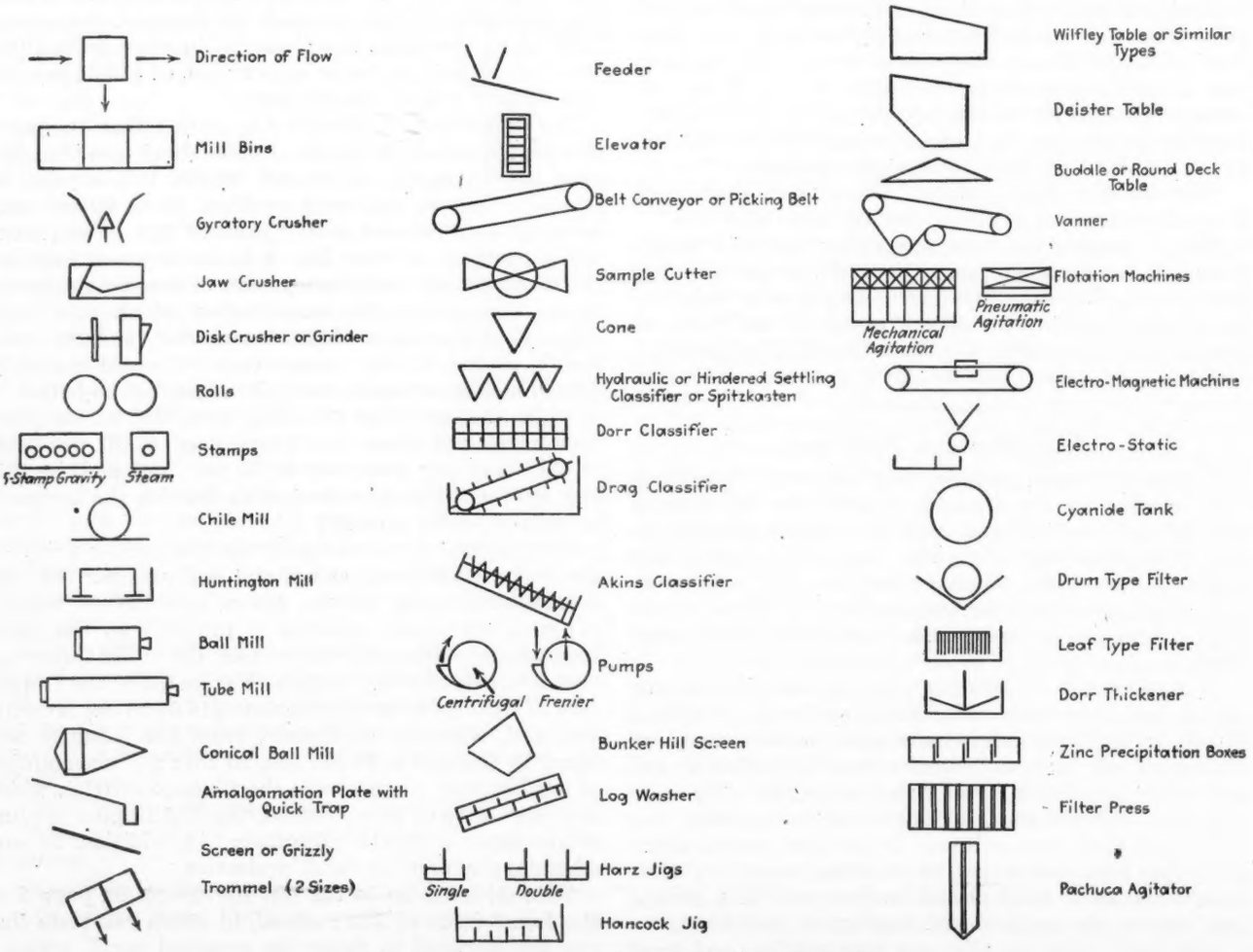
Considerable has been written about standardizing map conventions, conventional symbols for mine maps, geological maps, and topographical maps. Why not also have a set of conventions for mill flow sheets? The same advantages should apply to the flow sheet as to any form of map. There might be at least two objections on the ground that as there are so many kinds of milling machines, the flow sheet conventions would have to be named anyway, and in some cases there would be inadequate printing facilities. The first objection applies equally to conventions for all forms of maps, yet the advantages of symbols are admitted; and the latter objection applies only to lesser and unimportant publications.

The designs will no doubt be so numerous, to cover all forms of milling machinery, that the machines represented on a flow sheet will have to be named, but if each standard design bears a resemblance to the machine it is intended to represent, the reader will be greatly assisted in following the flow, much more so than if squares, rectangles, and circles, with the names of machines, or the names of machines alone, are used.

To be of the greatest benefit and of the least trouble and expense to reproduce, standard designs for mill flow sheets should bear striking resemblances, in so far as possible, to the machines or appliances represented, either in plan, elevation, or cross section. They should also be drawn with the least number of straight lines, circles, and arcs of circles that will give unique and unmistakable designs. I offer the accompanying list of conventions for mill flow sheets suggested as a basis upon which to build up a complete set of symbols.

ALBERT G. WOLF.

[The comment of our readers, with suggestions for changes and additions, is invited.—EDITOR.]



SUGGESTED MILL FLOW SHEET CONVENTIONS

By The Way

The Grimy Reaper

Most of the profit thus far derived from the opening of Indian lands in Arizona to prospectors seems to have been made by the Indian himself. Few strikes of importance have been reported, these including two recently made in Mohave County. But the Indian has reaped a harvest serving as guide. Thus the redman not only welcomes the invader to his last stronghold, the reservation, but even shows him the way.

Isaac Walton and the Churn Driller

They are organizing a fishing school for mining men down in the Joplin-Miami zinc and lead field. The section borders on the Ozarks, where particularly good bass fishing is to be had, but the fishing school for the mining men is of a different sort. Drilling in portions of the district is very difficult, and many strings of tools are lost, so the idea of the school is to get drill men together for a discussion of the best methods of fishing for tools when they are lost. The movement is under the head of the Kansas Geological Survey, and it is hoped to get the help of Federal assistance under the Smith-Hughes law for vocational training. Eight drill men were present at the organization meeting of the class.

The Fossil of the Metamorphic Sierra

"In the winter of 1863, I came to Bear Valley as the sole occupant of a stage-coach," wrote Clarence King in "Mountaineering in the Sierra Nevada." "The Sierras were quite cloud-hidden, and desolation such as drought has never before or since been able to make reigned in dreary monotony over all the plains from Stockton to Hornitas.

"Ordinarily solitude is with me only a happy synonym for content; but throughout that ride I was preyed upon by self-reproach, and in an aggravated manner. The paleontologist of our survey, my senior in rank and experience, had just said of me, rather in sorrow than in unkindness, yet with unwonted severity, 'I believe that fellow had rather sit on a peak all day, and stare at those snow-mountains, than find a fossil in the metamorphic Sierra'; and, in spite of me, all that weary ride his judgment rang in my ear.

"Can it be? I asked myself; has a student of geology so far forgotten his devotion to science? Am I really fallen to the level of a mere nature lover? I rededicated myself to geology. . . . For many days thereafter I did search and hope, leaving no stone unturned, and usually going so far as to break them open. Indeed, my third hammer and I were losing temper together, when one noon I was tired and sat down to rest and lunch in the bottom of Hell's Hollow, a canyon whose profound uninterestingness is quite beyond portrayal—it seemed to me the place of places for a fossil. Here was nadir, the snow-capped zenith of my heart banished even from sight.

"Jagged outcrops of slate cut through vulgar gold dirt at my feet. Picking up my hammer to turn homeward, I noticed in the rock an object about the size and shape of a small cigar. It was the fossil, an object for which science had searched and yearned and despaired! There he reclined comfortably upon his side, half-bedded in luxuriously fine-grained argillaceous material—a plump, pampered belemnites (if it is belemnites), whom the terrible ordeal of metamorphism had spared. I knelt and observed the radiating structure as well as the characteristic central cavity, and assured myself it was beyond doubt he. The age of the gold-belt was discovered! I was at pains to chip my victim out whole, and when he chose to break in two was easily consoled, reflecting that he would do as well gummed together.

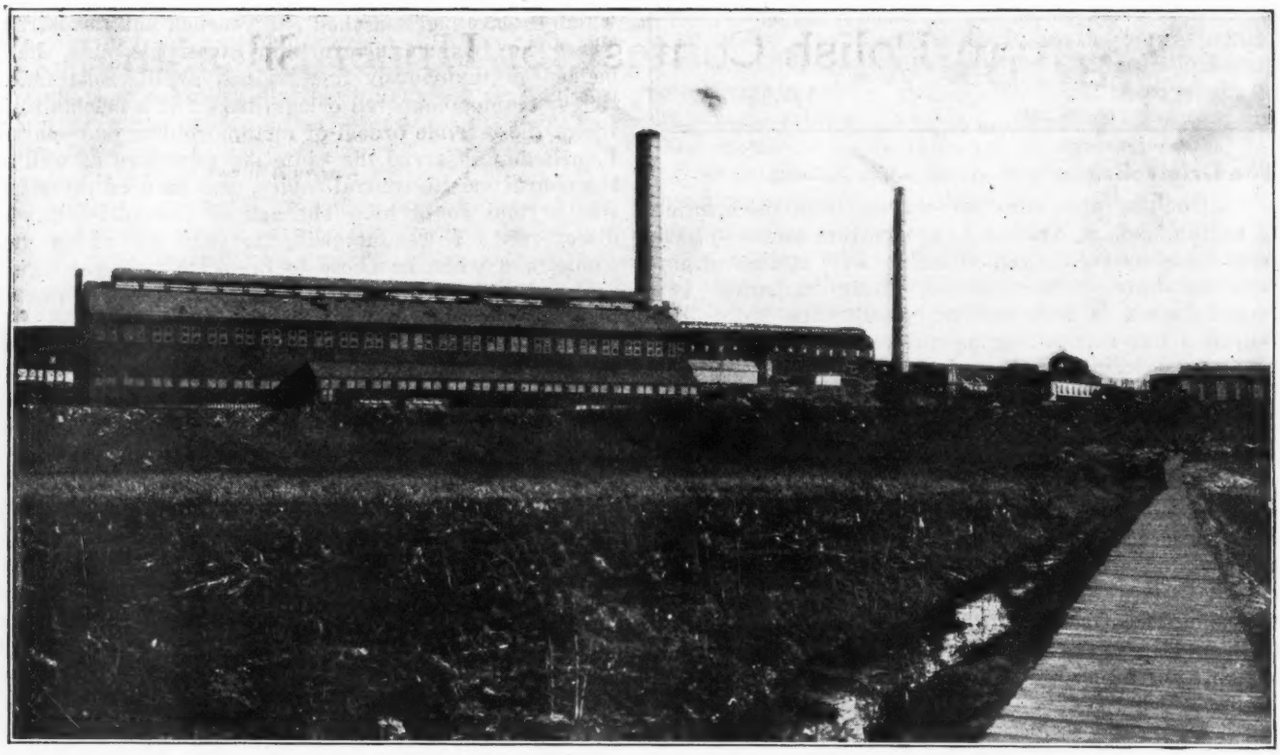
"I know this mollusk perfectly by sight, could remember how he looked on half a dozen plates of fossils, but I failed exactly to recollect his name. It troubled me that I could come so near uttering without ever precisely hitting upon it. In ten or fifteen minutes I judged it full time for my joy to begin.

"Down the perspective of years I could see before me spectacled wise men of some scientific society, and one who pronounced my obituary thus: 'In summing up the character and labors of this fallen follower of science, let it never be forgotten that he discovered the belemnites'; and perhaps, I mused, they will put over me a slab of fossil raindrops, those eternally embalmed tears of nature.

"Once in after years I met an age German paleontologist, fresh from his fatherland, where through three-score years and ten his soul had fattened on Solenhofen limestone and effete shells from many and wide-spread strata. 'Ach!' he said, with a kindle of enthusiasm, 'I have pleasure you to meet, when it is you which cephalopoda discovered has.' Then turning to one who enacted the part of Ganymede, he remarked, 'Zwei lager.'"

From Philadelphia

A patent expert of Philadelphia holds the key to the gold situation, according to the Sunday supplement of the *New York Herald*. Thus the city of Ben Franklin now produces Mr. Hunter, who, it is said, refuses to use the great power given him by his solution of the old alchemist's problem lest he injure society. "I think it would be a good thing to make gold to the amount of five billion dollars—or perhaps as much as twice that amount, and then destroy the record of the process so that no more could be made." According to the *Herald*, Mr. Hunter insists that he can make gold at a cost of from six to ten cents for what we now regard as a dollar's worth of the metal. He claims he has not only produced gold from silver and copper in his laboratory, but has also made tungsten from silver. "If I had a few crucibles and an excellent kitchen fire at my command," Mr. Hunter is reported as saying, "I could not only transmute silver into gold, I could take the very food that you have left on your plate at breakfast and transmute that into gold. As a matter of fact, it is easier to make gold than it is to make many cheaper metals; it is easier to make gold than it is to make tin. I have never made jewels, but it is possible to make diamonds as big as your fist, and to make them so that they will sell for prices so small that I wouldn't dare to mention them to a skeptical public."—Mr. Hunter is urged to let a few of us, at least, in on his secret. It is rather tantalizing for this Midas, who can even turn food into gold, to dazzle us with glimpses of his wealth but who slams the door in our faces when we try to peer within.



SMELTER OF THE MOND NICKEL CO., LTD., CONISTON, ONTARIO

Photographs From the Field

POURING SLAG FROM ELECTRICALLY TILTED 23-TON POTS AT THE SMELTER OF THE INTERNATIONAL NICKEL CO., COPPER CLIFF, ONTARIO

German-Polish Contest for Upper Silesian Mineral Riches

Assignment of Territory by the Peace Conference Transfers to Poland, Subject to Plebiscite, One of the Most Important Mineral Areas of Europe—Region Produces Coal, Zinc, Lead and Iron

By John E. Orchard
Harvard University; formerly Assistant Mine Economist, U. S. Bureau of Mines
Written exclusively for *The Journal*

THE future economic position of Germany is today the subject of much speculation. The bugaboo of German cheap goods, of German selling methods, of German trade penetration is ever present in the minds of the commercial interests of the Allied countries, who cannot forget that in 1914 Germany was rapidly becoming the dominant factor in many branches

JOHN E. ORCHARD

of international trade, through private initiative and government encouragement. At present little of the complicated trade structure built up so carefully remains. It is conceivable, however, that it may be rebuilt in time; but Germany will labor under serious handicaps. She has suffered a military defeat; her people are in a state of unrest; her industries seem to be disorganized; her financial control in Allied countries has been destroyed by the vigorous administration of alien property laws. Furthermore, Germany has lost very important territory from the industrial standpoint. It is with the strip of territory ceded to Poland, and more particularly with that part known as Upper Silesia, that the present article is concerned. The discussion is limited to the mineral wealth of the region.

Before entering into the discussion of mineral resources, it is necessary to explain briefly the limits of the ceded territories and the terms of the Treaty of Peace applicable to them. The Peace Conference, in determining the new eastern boundaries of Germany, followed two cardinal principles: first, the re-establishment of the ancient State of Poland by restoring to Polish sovereignty the area taken by Prussia at the time of the first partition of Poland in 1772, and, secondly, the placing under Polish rule of such districts as are predominantly Polish in population. As a corollary in this latter principle, Germany was permitted to retain districts predominantly German in population, even though they were within the original limits of Poland. In other words, boundaries were established along ethnic lines. In a brief article, only the barest description of the new boundaries is possible, but on the accompanying map the general limits of the ceded territory are indicated.

The western boundary of the former Kingdom of Poland was taken as a basis and followed closely with some deviations to straighten frontiers and to conform to the ethnic ideal. Practically all of West Prussia and Posen is ceded without reservation to Poland. Danzig, with a small area at the mouth of the Vistula River, is made a free city. The northern part of East Prussia, lying along the Baltic Sea and bounded by the Nogat and Vistula rivers on the west and by the Niemen River on the east, is retained by Germany, though no longer contiguous to the main part of the empire. The rule of the remainder of East Prussia is to be determined by a plebiscite.[1]

In the treaty, as originally presented to Germany, the new boundary from a point near Lorzendorf, a village situated about ten miles from the junction of the southern administrative boundary of Posen with the German-Russian frontier of 1914, was defined as a line drawn across Silesia to a point on the former German-Austrian frontier about five miles east of Neustadt. In other words, Upper Silesia was ceded outright to Poland, along with West Prussia and Posen. Germany entered a vigorous protest to this loss of territory, on the ground that Upper Silesia had not been a part of Poland since 1312[2] and that the population was predominantly German. The reply of the Peace Conference was to continue the boundary from Lorzendorf along the old administrative boundary of Posen to the former German-Russian frontier and thence along that frontier and

[1]Treaty of Peace, Articles 27, 28, 87, 94, 100.

[2]Silesia was conquered from Poland by John of Bohemia in 1312. Bohemia passed under the rule of Austria in 1526 with the election of Ferdinand, Duke of Austria, to the throne of Bohemia. In 1763, at the end of the Seven Years War, Austria ceded both Upper and Lower Silesia to Prussia.

the German-Austrian frontier to the point near Neustadt and to provide a plebiscite for Upper Silesia, the area between this latter boundary and the Lorzendorf-Neustadt line as originally defined.[3]

The principal terms of the plebiscite to be held in Upper Silesia are as follows: Upon the coming into force of the Treaty of Peace, the plebiscite area is to be placed under the authority of an International Commission of four members to be designated by the United States, France, the British Empire, and Italy. This commission is to enjoy all the powers previously exercised by the German government, except those of legislation and taxation, and over the latter the commission is to have the power to veto changes. To maintain order and to enforce regulations of the commission, troops of the Allied and Associated Powers are to occupy the area until the terms of the treaty are carried out. Fifteen days after the coming into force of the treaty, all German troops and certain designated German officials are required to evacuate the area. Workmen's and soldiers' councils are to be dissolved, and the members, if natives of another region, are to be evacuated. All military and semi-military organizations formed in the area are to be immediately disbanded.

The vote is to take place at such date as may be determined by the principal Allied and Associated Powers, but not sooner than six months or later than eighteen months after the establishment of the commission in the area. The right of vote is to be given without distinction of sex to all persons who have completed their twentieth year on Jan. 1 of the year in which the plebiscite is held and who were born in the area or have lived there for a period of time to be determined by the commission, or have been expelled by the German authorities and have not retained their domicile there. These provisions are aimed to defeat the colonization and deportation schemes of the Germans, who have been making every effort to establish a German population in the area. At the conclusion of the voting, the commission is to recommend to the principal Allied and Associated Powers the line which should be adopted as the

TERRITORY CEDED BY GERMANY TO POLAND

[3]Treaty of Peace, Article 88.

frontier of Germany in Upper Silesia as determined by the wishes of the inhabitants.[4]

Before proceeding to the discussion of the mineral resources, it may be well to mention the treaty provisions as to property rights in the ceded areas. Poland is to acquire all the property and possessions belonging to the German Empire or to the German states situated within the ceded territory. The value of such property is to be fixed by the Reparation Committee, whose powers are defined in Annexes II to VII of Section I of Part VIII, and paid by the Polish state to the committee for the credit of the German government on account of sums due for reparation.[5]

Private property belonging to a German national within the ceded territory may be liquidated, but the proceeds are to be paid directly to the owner, whose rights are to be protected by the mixed arbitral tribunal provided for in Section VI of Part X. The property of German nationals who acquire Polish citizenship by the cession of the territory will not be disturbed.

The territories ceded by Germany to Poland and those submitted to a plebiscite are of the very greatest economic importance. Posen, West Prussia, and East Prussia are mainly agricultural. A few mineral deposits are known, but they are of little importance. Upper Silesia, on the other hand, is one of the most important mineral regions not only of the former German Empire but of Europe. Its area, as compared with West Prussia and Posen, is small, but its wealth is great.

The result of the plebiscite will be of vital importance to Germany and to the new state of Poland. If the inhabitants decide for Polish rule, Poland will become one of the leading producers of minerals in Europe; if they decide for German rule, one domestic source of raw materials will be saved to the German metal industries, handicapped by the cession of the mineral districts of western Germany to France and by the destruction of Germany's financial control of foreign mineral production.

Upper Silesia has an area of approximately 5,000 square miles. The population has been estimated at 2,200,000, of whom 1,700,000 are Polish. The principal mineral resources are coal, zinc, lead, and iron. The manufacture of iron and steel is an important and growing industry.

CITY OF ZAHRZE, IN UPPER SILESIA

It has been impossible to secure recent statistics of mineral production in Upper Silesia. The output of the district has been included in the total output for the German Empire, but no separate official figures have been given. The information in the following paragraphs has been secured for the most part from the statements presented to the Peace Conference by the Polish Economic Delegation, supplemented by statistics from the report of the British Economic Mission, and from the Russian year book. Most of the statistics are for the years 1910 and 1911. All figures of production have been reduced to short tons.

Zinc.—Although the output of coal is much larger

[4]Treaty of Peace, Annex to Article 88.
[5]Treaty of Peace, Article 256.
[6]Treaty of Peace, Articles 92, 297.

zinc is probably the most important mineral resource of Upper Silesia as far as Germany is concerned. At one time Upper Silesia was the principal source of zinc in the world, and in 1913 it was not only the leading producing district of the empire, but of all Europe. The principal deposits are near Beuthen, on the former boundary between Russia and Germany, extending also into Russian Poland and Galicia. The deposits of Galicia have been of little importance, but those lying in Kielce and in the neighborhood of Olkusz, Russian Poland, are the most important producers of European Russia.

The zinc deposits of Silesia are of the same general type as those of the Mississippi Valley. They contain both lead and zinc and occur in Triassic formation overlying carboniferous coal-bearing rocks. The close proximity of a plentiful supply of fuel has greatly stimulated the growth of the smelting industry. The ores are chiefly smithsonite and blende, but other calamine deposits occur in the form of stockworks, pipes, and sheets, sometimes in beds or pockets of residual clay. These last-named deposits were the first to be worked and are now approaching exhaustion.[7] The calamine ore is reported to average about 25 per cent zinc and the blende 40 per cent, which, however, appears to be too low an average in view of the reported output of metal.

In 1910, the latest year for which separate production statistics for Upper Silesia are available, the district produced over 650,000 short tons of ore, or approximately 80 per cent of Germany's total output for that year. The relative percentage probably did not decrease during the later pre-war years, although there was a decline in the total output of Germany.

Much of the zinc ore of Silesia has been treated in local smelters, which have produced about 200,000 tons of metal annually. It is estimated that about 30,000 tons of ore was exported annually to Galicia and about 100,000 tons of metal to the Rhine district of Germany and to neighboring countries.

Five of the sixteen principal zinc smelters of Germany were situated in Upper Silesia at Lipine, Beuthen, Shurentochlowitz, and Kattowitz. The remaining smelters, most of which were in Rhenish Westphalia, depended largely upon imports for their supplies of zinc ores. As Germany's most important source of zinc ores and concentrates, Australia, has been cut off for some time to come, the future of the zinc industry along the Rhine would seem to be far from promising. Only about one-third of the former supply of ore will be available. There is a possibility of increased production in Silesia, however, as the output of the mines has been limited by the capacity of the local smelters for a number of years. Germany may be able to import a part of the surplus.

Financial control of the zinc deposits of Silesia has been largely in German hands. One of the large smelters was owned and operated by the Prussian government. When the German Zinc Syndicate was formed in 1909 by the Merton group, Beer, Sondheimer & Co., and Aaron Hirsch & Son, the Silesian concerns immediately became members. As pointed out previously, the property owned by the Prussian government will be acquired by the Polish government. There will be no change in the ownership of the private mines except those owned by German nationals refusing to accept Polish citizenship. Before the war French capital had secured a foothold in the district and also in Russian Poland. Considering the great demand for capital in Poland and the friendly relations existing between the two nations, it is probable that the French financial control will be extended.

Coal.—The coal deposits of Upper Silesia are only a part of the huge field extending also in Austria and Russian Poland. The center of this field, which covers probably 2,000 square miles, is under the small town of Myslowice, called the three empires point, because there the former frontiers of Germany, Austria, and Russia met. In passing it may be stated that the Dombrowa field, situated in the Petrokov and Kielce provinces of Russian Poland, is the most productive field of Russia. Large-scale production did not begin there until 1912, but the increase was rapid in the two following years.

By far the largest part of the Polish field lies in Upper Silesia. Estimates of the reserves in the entire field vary considerably, ranging from 85 billion tons to 255 billion tons. If the minimum estimate of 85 billion tons, made by the Polish Economic Delegation, is taken as a basis, 51 billion tons, or 60 per cent, lies in Upper Silesia, 29 billion tons, or 34 per cent, in Galicia and Austrian Silesia, and 5 billion tons, or 6 per cent, in Russian Poland. It has been estimated by the International Geological Congress that 10 per cent of Germany's "actual" reserves of bituminous grade coal and almost 40 per cent of her total "actual" and "probable" reserves of all grades was in Silesia.

Practically all of the coal of Upper Silesia is of bituminous grade. The deposits are thick and easily mined. Unlike most of the coal found in Russian Poland and Galicia, the Silesian coal produces coke of a good quality. The value of the coke production, with the accompanying byproducts, is nearly $25,000,000 per year.

It was in the Silesian portion of the field that exploitation first began. As early as 1800, the annual production was 116,000 short tons. Since that year development has been rapid, and in 1913 there was a production of 48,267,000 tons. The fields of Dombrowa, in Russian Poland, and Cracow, in Austria, produced in the same year 7,119,000 and 2,094,000 tons respectively. In all of Germany in 1913 somewhat over 305,714,000 tons of coal was produced, the Upper Silesian output amounting to over 15 per cent of this total.

Not only has output been large, but the deposits are far from being exhausted. With improved and more intensive methods the mines may be made to produce much larger quantities. The coal fields of New Poland will rank among the leading producers of Europe, being surpassed probably by only Great Britain and France.

Only a small amount of Silesian coal has been shipped to the Rhine. Freight rates on German railways have been determined on the basis of cost of service; that is, the tariffs have been a uniform mileage rate plus terminal charges. Accordingly, goods that can reach a market only after a long haul by rail have difficulty in competing with goods produced close at hand, because of the high freight rate that must be added to the cost of production. This fact has been particularly true of the agricultural and mineral products of eastern Germany. Despite the protests of the producers, the government has refused to grant lower rates, and eastern Germany has been as far, economically, from the industrial sections of the Rhine as New York.

The Silesian coal, unable to compete on the Rhine with the coal of Westphalia and the Sarre Basin, has been used mainly in the metallurgical and manufacturing industries of eastern Germany. Some shipments have been made by water to nearby countries—to Denmark, Norway, Sweden, and Russian Poland. Taken alone,

[7]Unpublished report, U. S. Department of the Interior.

therefore, the loss of the coal output of Upper Silesia would not be a serious blow to German industry, which has never depended upon it; but with the loss of the Sarre Basin, Germany hopes to retain Upper Silesia as a source of supply to supplement the fields of Westphalia.

If Silesia decides for Polish rule, the coal will be used in much the same region as at present; that is, in local industries, in Posen, in West Prussia, and in East Prussia. As in the case of zinc, production may be sufficiently increased to provide a surplus for export to Germany.

It has been remarked that without the Silesian coal fields Prussia would have remained a second-rate power, politically and economically, but this statement would seem to be an exaggeration. It is apparent, however, that from the standpoint of the economic wealth of the empire, the loss of this coal field will be a serious one.

Most of the coal mines of Upper Silesia have been owned and operated by German capital. A large part of the production has come from a group of mines owned by the Prussian government. The coal operators of the district have been united for a number of years in the Upper Silesian Coal Syndicate. Through ownership of the Koenigen Louise Mines, the Prussian government has exercised an active influence in the affairs of the syndicate. The effect of the cession of territory upon the commercial control of the government-owned mines and those owned by German nationals has already been indicated in the paragraphs on zinc.

Lead.—There remains little to be said for lead that has not already been said for zinc. The ore is found with the zinc, and the geological formation is therefore the same. The mineralization is found in two horizons. The lower, characterized by blende with a little galena and marcasite, which contains a trace of arsenic and nickel, lies at a depth of 64 to 115 m. below the surface and in places attains a thickness of 15 m. The upper, or lead horizon, lies 12 to 15 m. above the lower one and is above water level.[8]

Production of lead has been of much less importance than the production of zinc. The deposits of Upper Silesia and of Galicia and Russian Poland provided a flourishing industry two hundred years ago, but at present those situated in Galicia and Russian Poland have been practically abandoned.

In 1910 about 65,000 tons of ore was produced in Upper Silesia, and in 1913 one-half of the lead ore produced in Germany was obtained from that region. Before the war the annual exports of lead from Upper Silesia equaled about 30,000 tons. The Prussian government has controlled the lead output through the operation of a smelter at Tarnowitz, which consumed practically the entire yield of the Upper Silesian mines and produced about 45 per cent of the lead output of Germany.

In pre-war years Germany ranked third among the pig-lead producers in the world, but only about 40 per cent of her production came from domestic ores, German smelters being dependent upon imports for their supplies. It is certain that imports from Australia will not reach the pre-war total for a number of years, and the smelters will be sure of only about 20 per cent of the ore previously consumed.

Iron.—Little information of a definite nature is available regarding the iron-ore deposits of Upper Silesia. It is known that they are large, but up to the present there has been little development. The reserves of the entire Polish field extending into Russian Poland and Galicia have been estimated at 300 to 400 million tons. The most important producing mines at present are near Olkusz, Dombrowa, Czestochowa, and Wielun, Russian Poland, but those in Upper Silesia are a close second. The Galician fields have been of little importance.

In 1910 the production of iron ore in Upper Silesia was a little over 250,000 tons, only about 1 per cent of Germany's total output. If the above estimates of reserves are at all accurate, production may be increased considerably. The ore is a low-grade brown ore, averaging about 35 per cent. Production has not been sufficient even to supply the local industries of Upper Silesia, and large quantities of ore have been imported from Sweden, Hungary, Russian Poland, and Spain. The iron and steel industry was being developed rapidly before the war, and in 1912 there were forty-six metallurgical plants, producing about 1,000,000 tons of pig iron and 1,500,000 tons of iron and steel.

It is apparent that the loss of the present production of iron ore in Upper Silesia will be of slight importance to Germany as compared with the loss of the Lorraine fields.

Minor Deposits.—Deposits of silver and chromite have also been reported in Upper Silesia, but they are so small and of such low grade that they have never been worked. The cement industry has a production of about 7,000,000 bbl. annually. There are in Upper Silesia thirty quarries, with an annual output valued at $2,500,000. Clay suitable for the manufacture of porcelain is also found.

By the cession of Upper Silesia, Germany will suffer a serious loss in mineral wealth. We have seen that the area in pre-war years produced 80 per cent of Germany's zinc ore, 15 per cent of her coal, 50 per cent of her lead ore, and 1 per cent of her iron ore. The loss assumes much more serious proportions when we take into consideration the iron deposits of Lorraine and the coal deposits of the Sarre Basin, ceded to France. It is, of course, impossible to determine this loss in definite quantities, but in the following table an attempt is made to show the probable output of the four minerals in the territory left to Germany, production for 1913 being used as a basis.

PROBABLE MINERAL PRODUCTION OF GERMANY

(In Short Tons)

	Former Germany	Lorraine	Sarre Basin	Upper Silesia	New Germany
Coal	305,000,000	.....	40,000,000	48,000,000	217,000,000
Iron	26,000,000	23,250,000	.....	250,000	1,500,000
Zinc	700,000	.....	.....	560,000	140,000
Lead	140,000	.....	.....	65,000	75,000

Germany retains about 70 per cent of her former coal production, 6 per cent of her iron ore, 20 per cent of her zinc ore, and 53 per cent of her lead ore. And for a number of years about 30,000,000 tons of the coal production that she retains must be turned over to France, Belgium, Italy, and Luxemburg.

One measure of relief is provided by the Treaty of Peace. Poland undertakes for a period of fifteen years to export to Germany, free of all export duties, the products of the mines of any part of Upper Silesia transferred to Poland in accordance with the terms of the treaty. Poland also agrees to grant as favorable terms for sale of such products to purchasers in Germany as to purchasers in Poland or any other country.[9]

[8] Unpublished Report, U. S. Department of the Interior.

[9] Treaty of Peace, Article 90.

Who Owns the Earth?

A Comparison of the Mineral Wealth of the Nations Shows the Influence of Certain Policies That Have Been Followed in the Procuring of Their Holdings— Position of United States, England and Japan

BY J. E. SPURR

LITERALLY and figuratively, the ownership of the earth is the ownership of its mineral wealth. Recent studies made by my associates throw a concentrated light on the present and prospective ownership, and the accompanying charts give a graphic portrayal of relative control by different peoples. Of these, Fig. 1 shows political (or rather in this case, strictly territorial) control, and Fig. 2 commercial control. As based upon the territorial and commercial control of the fundamental minerals, it appears that the earth is owned by the two great Anglo-Saxon nations, the United States and the British Empire; the former by destiny and good fortune, and without political plan or policy, in that such a vast store of mineral wealth of nearly all kinds was found in the great sparsely populated wildernesses of America which it occupied; the latter through the imperial policy of Britain, developed through hundreds of years by the need of extending commerce and the flag into far-off lands to supplant the slender resources of Britain's own limited islands. Of the two, the United States is rather in the lead, and possesses and controls more of the world's mineral wealth than any other nation; but Great Britain is a close second.

Rapid changes occur, however, in these days, and the future must be inspected. The imperial policy of expansion and increasing political control has become a tradition and an instinct with Great Britain; she learned since the loss of her American colonies to give full autonomy to her more intelligent dependencies, so that she strengthens her dominion thereby, and persistently goes on her way, putting more and more of the earth under the British flag. Just so, the wealth and resources of the United States being so far greater than our necessities, foreign problems have resolved into occasional questions of self-protection, and from this condition a directly resulting theory has sprung, of non-interference in the rest of the world. Like China, we declare ourselves apart from the world, and simply ask to be left alone, in consideration of which we agree to leave the world alone. Our Monroe Doctrine, as originated, is part of that theory—we wanted the world to leave all the Americas alone; but took no responsibility for the Americas otherwise—a selfish and one-sided position.

LACK OF POLICY IN REGARD TO AMERICAN MINERAL INDUSTRIES

Therefore, as regards our great industries, and, more specifically, our mineral industries, we have never had a definite policy; our troubles and problems were purely internal, and the Government's efforts were largely directed toward the prevention of such solidarity of any one industry that its power should be too great, although American organizing genius first successfully developed these colossal business combinations, rising without Government support. England, too, and France, with their democratic proclivities, tended to resist the overwhelming power of great business organizations, as inclining toward the destruction of equal opportunity and threatening the power of the state. It remained for Germany pressing impudently toward the conquest of the world, to see the advantage of combining the powers of the state with those of business monopolies, as a means of regulating industry at home and overpowering other nations abroad; and so the old question of the union or separation of Church and State becomes one of Business and State.

The success of this plan of German penetration was most clearly and disagreeably brought home to the British mind by the war, as well as to the French and the American perception, and during the war England took under government control her mineral industries more definitely and systematically than did we. Moreover, perceiving the success of the German system as a means of penetration, and as a method against competitors, she has adopted it, there being a striking tendency to put her key industries under syndicates, unions, cartels, or trusts controlled directly by the state.

A system of state socialism thus takes the place of the freedom of individual competition, and, as regards the mineral industries, much the same action has been taken by France. But in America, dropping all the problems and half-learned lessons of the war, we return to the *status quo ante*. If this difference continues, it is certain that British control of the earth—whereby we mean its minerals—will eventually preponderate. As far as we are concerned, we would perhaps rather see it in the hands of Great Britain than of any other power, but must we not decide upon our own course as a rich and populous nation of an increasingly close-packed but seething and yet unorganized globe?

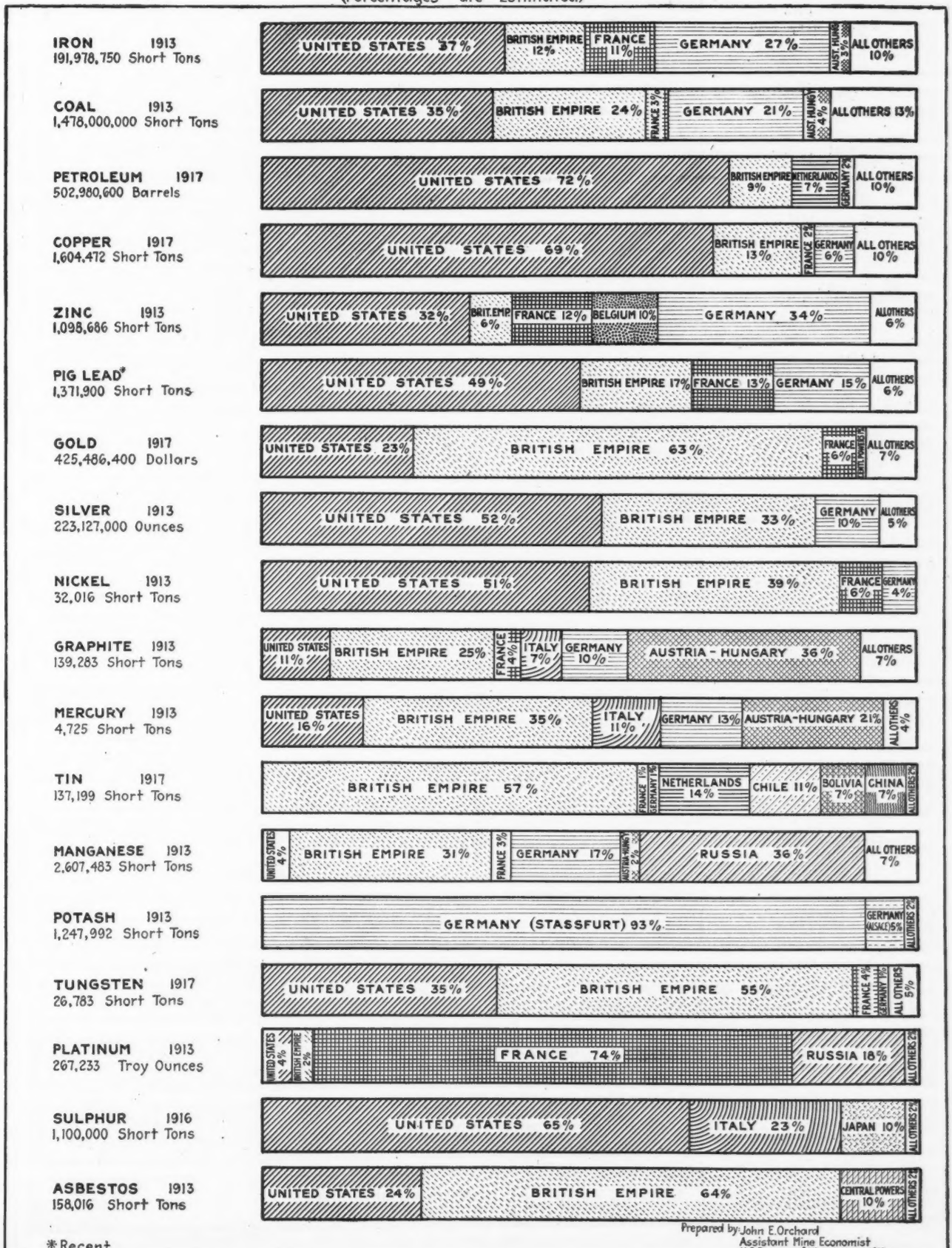
Our statesmen, newspapers, and financiers proclaim to the world that we intend to take the lion's share of the world's shipping and commerce. England says nothing, but puts her government directly behind her own industries, while the American Government still holds aloof from them. Nationalism has been revived in Europe, and especially in England and France, as the result of the struggle to prevail against the intense German nationalistic spirit, which all but subjugated a world drifting comfortably into internationalism. It is conceivably a step backward, a reversion, but what attitude shall America take? The British and French nationalism need not disquiet us so much as that of the Japanese, still more intense and purposeful, and working with the same German tools (not invented in Germany, but in America, but, like most German arts, successfully copied and utilized), now adopted by England and France in self-defense. America also has had a rebirth of nationalism, quite necessary in the existing state of affairs.

As the case now stands, the United States largely predominates in the petroleum industry, with 71 per cent of the world's production in 1917; England, far behind, is in a way to overtake us with giant strides

FIGURE 1

COMMERCIAL CONTROL (FINANCIAL)

(Percentages are Estimated)

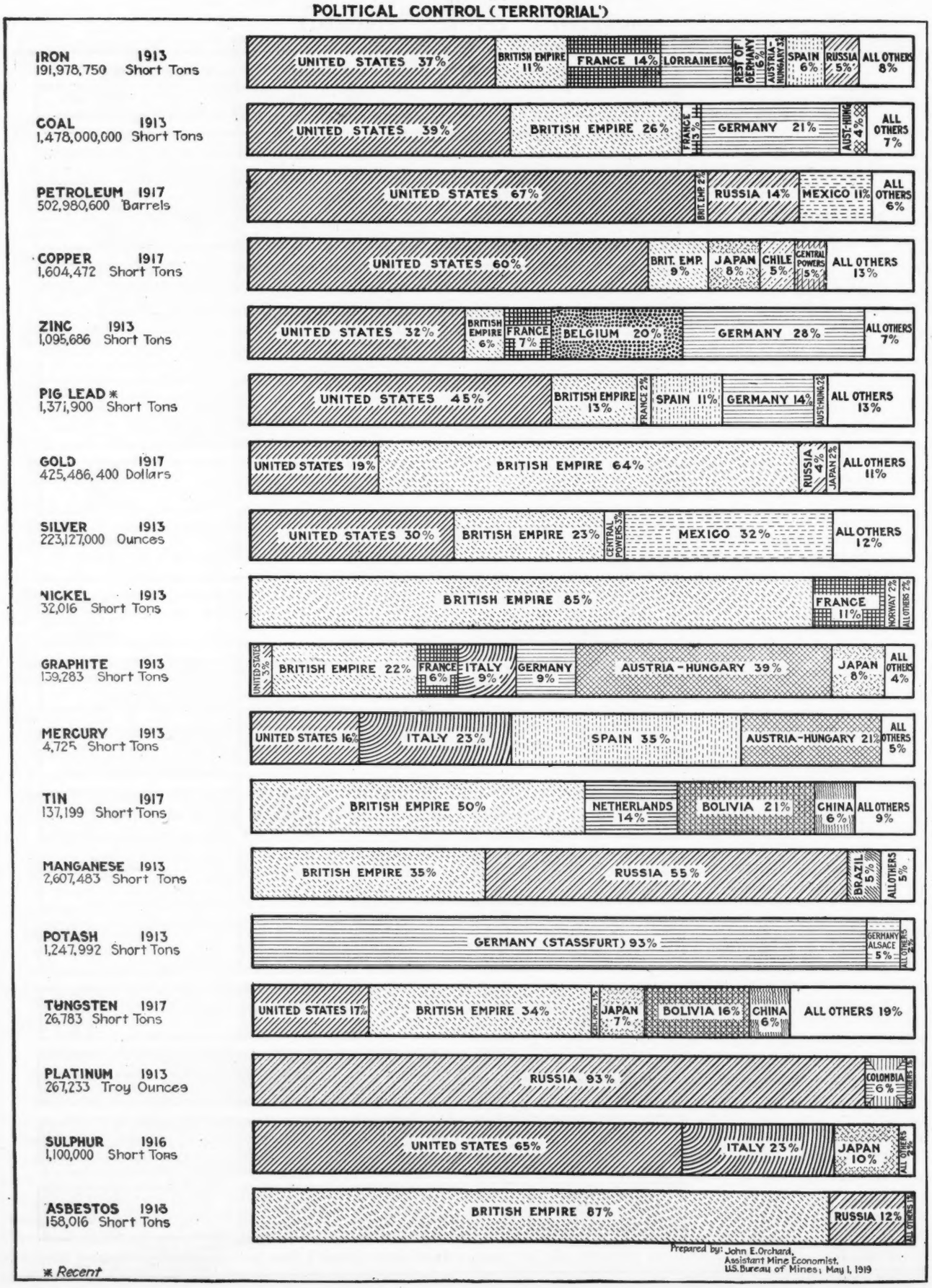


*Recent

Prepared by John E. Orchard
Assistant Mine Economist
U.S. Bureau of Mines; May 1, 1919

FIGURE 2

POLITICAL CONTROL (TERRITORIAL)



under her new system. In the basic necessities of coal and iron, the United States also leads. The second place in the steel industry, held by Germany, was presumably lost as a result of the war, and probably passes to England, already second in coal and with her iron industries in charge of a government-controlled syndicate for purposes of protection and expansion.

In copper, the United States is far away in the lead, with England a long second, and in lead, also, with half the world's production, with England second. Before the war England and Germany were about tied for second place, and the latter was rapidly drawing ahead through her state-controlled commercial methods; but the war will set her back greatly. In zinc, the United States had the greatest production (32 per cent) before the war, slightly more than Germany (28 per cent), but German methods gave it the preponderance of actual commercial control. The result of the war will restore the commercial supremacy to the United States, and the importance of England will increase. In silver, the United States now leads in production in both territorial and commercial control, and, by her commercial control over Mexican production, controls one-half of the world's output, with Great Britain a strong commercial second, having nearly 40 per cent of it.

In the production of the important mineral, sulphur, the United States is far in advance of the world, with 65 per cent of the world's production in 1916. Italy is second, Japan third, and England is practically unrepresented. Phosphate rock is dominated, both territorially and commercially, by the United States, but there are other supplies for England, and France has abundance in her own territory. Vanadium is commercially controlled by the United States, although territorially by Peru. Molybdenum has very lately come to be controlled by the United States, with Great Britain, formerly first, now second. In uranium and radium the United States also has first place, with Austria a long second. The aluminum industry is strongest in the United States, although very important also in France.

Great Britain Stands High in Productivity of Mineral Wealth

In the following, however, Great Britain has control: The important "key industry" of tin, where her territorial control is one-half and her commercial control absolute, whereas the United States is not represented; in the important nickel industry by territorial control of 80 per cent, and by a commercial control that is now probably predominant over the strong American interests, as a result of an active government policy; in tungsten she controls territorially the greatest production (34 per cent), and by her commercial supremacy 54 per cent (1917), the United States being second, with a commercial control of 35 per cent, although the territorial control is only 17 per cent, about equal to that of Bolivia.

In manganese, Russia nominally leads, with 36 per cent commercial control (55 per cent of production in 1913), but under present conditions the effect is to give England the lead, with the United States of minor importance. In chromium, Great Britain and France control through a syndicate, in which the British interest is in the majority, and the United States occupies a subordinate position with regard to both these countries. In gold production the British Empire controls 63 per cent; that of the United States is 23 per cent. In graphite in 1913 the British Empire was second to Austria-Hungary. It will now take the first place, and the United States will be a competitor. In asbestos, the British Empire produces 87 per cent and controls commercially 63 per cent of the world's total, the United States being negligible in production, but second in commercial control (of Canadian asbestos). Mercury, territorially, is mainly in the hands of Spain, but the industry is actually dominated by England, under selling arrangements. Antimony has long been controlled by England, but control may revert to China, which means the possibility of its becoming Japanese. Mica, essential for electrical work, is controlled by Great Britain.

Only a few minerals remain in which most of the industry is not in the hands of either the United States or England—potash, formerly a German monopoly, and now divided between Germany and France, with Germany likely predominant, and mineral nitrates, in Chilean territory, with no marked national commercial control other than that of Chile.

Both America and England are strong in their grip on the world's basic industries—England much stronger than before the war and with a freshly set purpose to expand. A combination of these two countries would amount to a practical world control, and, with France, a little stronger control. This much for the present, but uncertain quantities loom shadowy, in the destiny of Russia, the future of Asia, and the progress of Japan. Japan is intently embarking on a course toward the domination of Asia, politically and commercially. Her present position is not so significant as the consideration of her rapid progress, the knowledge of the rich field in which she is to work, and a study of her militaristic methods, which remind one of those of Germany. Japan holds to no ally that will not (temporarily) aid her in her forward march, and in the weakness of Russia, China, and Korea she sees her opportunity. The war to her was an unmixed blessing. She took no chances, and seized enormous advantages.

There are three great figures of nations which seem to have been destined to be, in these times, of critical importance to the United States: In the past Germany; in the present, Great Britain; in the future, Japan. The German question was settled in the only possible way; for England the only sane solution is a closer-knit alliance; and for Japan, watchfulness and friendly intentions.

"The Journal" as a Textbook

The *Engineering and Mining Journal* is used as consulting textbook in technical English at the Michigan College of Mines; at the Arizona School of Mines, the study of the *Engineering and Mining Journal* is a required study, which extends through several years of the course and is checked up by usual examinations.

Other mining schools are using *The Journal* in the same way, as a standard authority.

The coal miners at Epinac, France, are paid a bonus of 20 per cent of the dividends earned by the employing company. Houses are provided free of charge on condition that the man to whom the house is allotted works twenty-three days a month. A free chapel and a chaplain are also provided.

Applying the Blueprint Round

Complementary Apparatus and Reference Table Assure Practical Operation and Successful Results—Instructions as to the Use of the Method—Necessity for Agreement of Manufacturers on Standard Sizes for Connections.

BY CHARLES H. WATERS
Written exclusively for *The Journal*

ALL must agree that a proved system of holes to meet given physical conditions, such as size and nature of opening and character of rock, when properly applied, would without question give the nearest approach to the desired 100 per cent efficiency. But the question has been, how can they be drilled as planned. The first and most important object of a round is to have the center cut holes meet and "break bottom." When this can be done without fail, greater depths of rounds can be planned and, under some conditions, fewer holes, less powder, and a greater advance, and at less cost, may be realized.

"CUT HOLES" LIMIT ADVANCE

In general, the possible advance is limited only by the "cut holes." If the cut holes "bottom" regardless of how deep they are, all the remaining holes should "bottom," providing, of course, that they are properly placed. In small tunnels every inch should be utilized to gain a wider angle for the cut holes, thus adding to their power to "bottom," upon which, in the main, the remainder of the entire round depends. When the center cut holes intersect, the drill often breaks away material at that point, enlarging the hole and making a small chamber, making more room in which to concentrate the charge of powder, and giving the gases of the explosion more surface to work upon. If the cut holes are extended a few inches after they intersect, forming a cross, still better results can be obtained—approaching the conditions under which powder can do its greatest work. Care should be taken that overloading is not practiced, as it is perhaps the most common habit of the miner, at what loss to the mining world no one knows.

Before a standard round is adopted, several experiments should be made, and from them there should be determined the type of cut, the number and location of the holes, the depth of round, and the grade or grades of dynamite, and amounts of each, that will give the best results with a given size of opening and character of rock, before a blueprint round is planned and turned over to the machine man for execution. The experiments should be repeated when any marked change of rock is met. However, it is one thing to outline a test and establish the best round to meet given conditions and quite another to apply that system, for it is a difficult and trying problem, and, with the present equipment, it indeed becomes highly theoretical and falls short of the highest efficiency which might be realized. If a method could be devised by means of which the most efficient round decided upon could be applied, by the drill men, with accuracy, its purpose could be fulfilled.

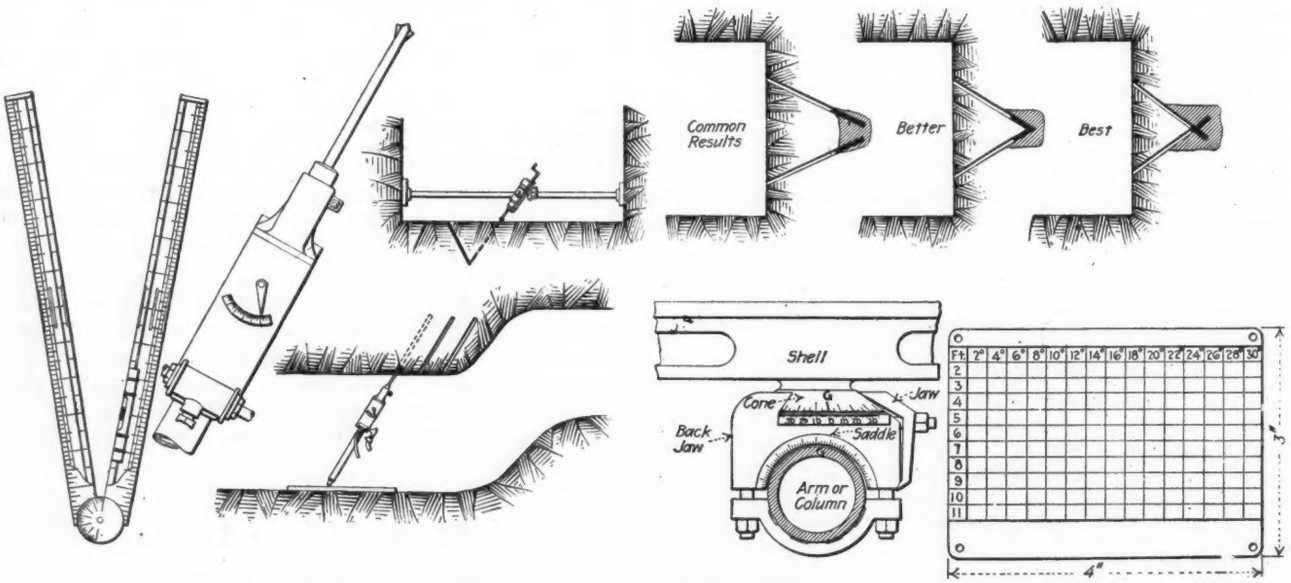


FIG. 1. APPARATUS USED AND DETAIL OF APPLYING THE BLUEPRINT ROUND

In the past the miner drilled a round of holes as best he could; but sometimes he "guessed" badly, and his results were not up to the average; and if he "guessed" well, the results were above the average and "broke fine." One reads about drilling the center cuts to "intersect," and in practice this happens sometimes, but often, and, in fact, very many times, it does not happen, because the pointing of the holes must be left to some man's "guess," instead of to the application of a system by means of which it can be done with exactness. How the artillery in the late war would have jumbled up an attack or defense if each gun had been directed by some one's "guess"!

In all thoroughly efficient organizations, there must exist, knowingly or unknowingly, consciously or unconsciously, what are commonly known as "the three C's," and to the degree that each one of these C's approaches the 100 per cent mark the average of the three C's represents the net efficiency of that organization. The three C's—confidence, co-operation, conditions—are the three legs upon which the success of any organization must rest. If it be possible to obtain 80 per cent confidence, 50 per cent co-operation and 70 per cent conditions, there will be a net average efficiency of 66⅔ per cent.

Importance of Specifying Hardness of the Ore in Reports

In reviewing the scores of engineers' reports under the heading of "Mining Cost," I have yet to read one that takes into consideration the "hardness" of the ore with any degree of detail, whether it be one or seven, or how the particular ore will "drill"; whether it needs 30 per cent or 60 per cent powder; will break well or badly; or is blocky, medium, or fine. Hardness and breaking characteristics should go hand in hand with each assay, and be so shown on the assay map, for without such knowledge reliable estimates and computations cannot be made. In most cases this neglect no doubt is caused by a more or less general lack of practical experience among engineers. Yet "Cost Statements" as well as "Estimates" are of little value without this data. Unless he has had actual experience in such matters, an engineer cannot hope to outline mining methods or an efficient round and cover items of depth, powder required, cost, and other essential details. All this is well known among miners, and they therefore have little confidence in the "blueprint" round when it is turned over to them for application, and so one of the C's (confidence) is far short of the 100 per cent mark, and results therefore fall short.

And, further, the miner essays to show that the blueprint round is impracticable to the extent that he cannot, with the present equipment, as furnished with a drill, do anything but "guess" at the degree at which a hole is drilled. How can he tell if his cut holes are run at the 24 degrees required by the blueprint? They may be 18 or 29 degrees; so he rightly concludes that the system lacks conditions (tools) in order to get the best results, and is therefore not practical. Again he is right. Thus, two of the three C's are running pretty low. Doing his best in placing and pointing the holes of the blueprint round, he perhaps does well if he gets it up to 70 per cent, and with confidence at only 40 per cent, conditions 70 per cent, it therefore follows that co-operation must be low indeed—perhaps no better than 60 per cent, which gives an efficiency average for the entire operation of only 58 per cent; pretty low, but a fair average, no doubt.

Practical Execution of the Blueprint Round

One of the first things to do after finding what round is best suited to a given set of conditions is to try to supply the miner with the proper conditions (tools) to aid him to carry into practical execution the blueprint round. This I have attempted to do for some time, and will here outline what I have done to meet this end and bring up "conditions," and thus also wonderfully effect both "confidence" and "co-operation," and in the end the net efficiency average.

In my first attempt to furnish the drill man with something that he could use to direct or point his holes at the proper degrees, I used a ruler made by Lufkin & Co., No. 863L, which has at its center hinge a scale with the degrees plainly marked. The rule also contains a small level on one of its sections. The machine man would place two sections of the rule parallel with the arm or bar and use the other sections of the rule to set his machine, and, by supplying him with a small card on which was written plainly the figures and deflection for the given proposed depth of round, he was able to place the holes with an accuracy that was seldom in error over 5 per cent at their ends, and results in progress made and saving in powder have averaged over 20 per cent. With degree plates placed upon the saddle, an accurate reading can be made, and with a table with instructions screwed upon the drill, finer work

USEFUL REFERENCE TABLE FOR DRILLING

Ft.	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°
3	1″	2″	4″	5″	6″	8″	9″	10″	1′	1′ 1″	1′ 2″	1′ 4″	1′ 6″	1′ 7″	1′ 9″
						1″	1″	1″ 1″	2″ 2″	2″ 2″	3″ 3″	4″ 4″	4″	5″ 5″	6″ 6″
4	2″	3″	5″	7″	9″	10″	1′	2″	4″	6″	8″	10″	2′	1″	4″
						1″	1″	2″	2″	3″	4″	5″	6″	6″	8″
5	2″	4″	6″	9″	11″	1′ 1″	1′ 3″	1′ 5″	1′ 8″	1′ 10″	2′	2′ 3″	2′ 5″	2′ 8″	2′ 11″
					1″	1″	2″	2″	3″	4″	5″	6″	6″	8″	10″
6	3″	5″	8″	10″	1′ 1″	1′ 3″	1′ 6″	1′ 9″	1′ 11″	2′ 2″	2′ 5″	2′ 8″	2′ 11″	3′ 2″	3′ 6″
					1″	2″	2″	3″	4″	5″	6″	7″	8″	10″	11″
7	3″	6″	9″	1′	1′ 3″	1′ 6″	1′ 9″	2′	2′ 3″	2′ 7″	2′ 10″	3′ 1″	3′ 5″	3′ 9″	4′
					1″	2″	2″	3″	4″	5″	6″	7″	8″	10″	1′ 1″
8	4″	7″	10″	1′ 1″	1′ 5″	1′ 9″	2′	2′ 3″	2′ 7″	2′ 11″	3′ 3″	3′ 7″	3′ 11″	4′ 3″	4′ 7″
					1″	2″	3″	4″	5″	6″	8″	9″	10″	11″	1′ 1″
9	4″	8″	11″	1′ 3″	1′ 7″	1′ 11″	2′ 3″	2′ 7″	2′ 11″	3′ 3″	3′ 8″	4′	4′ 5″	4′ 9″	5′ 2″
					2″	2″	3″	4″	5″	7″	9″	10″	1′	1′ 2″	1′ 5″
10	4″	9″	1′	1′ 5″	1′ 9″	2′ 1″	2′ 6″	2′ 10″	3′ 3″	3′ 8″	4′	4′ 6″	4′ 11″	5′ 4″	5′ 9″
				1″		2″	4″	5″	6″	8″	9″	11″	1′ 2″	1′ 4″	1′ 7″
11	5″	10″	1′ 2″	1′ 7″	2′	2′ 4″	2′ 9″	3 2″	3′ 7″	4′	4′ 5″	4′ 11″	5′ 4″	5′ 10″	6′ 4″
				1″	2″	3″	5″	6″	7″	8″	10″	1′	1′ 3″	1′ 5″	1′ 8″
12	5″	11″	1′ 3″	1′ 8″	2′ 2″	2′ 7″	3′	3′ 5″	3′ 11″	4′ 4″	4′ 10″	5′ 4″	5′ 11″	6′ 5″	6′ 10″
				1″	2″	5″	5″	6″	7″	9″	11″	1′ 2″	1′ 4″	1′ 7″	1′ 11″

Follow along line opposite depth of round wanted to column under degree needed. Figures above the line show distance bottom of hole will be shifted if drilled at that angle.
Figures below line show distance to add to make hole extend to full depth of proposed round.
(The table, with instructions, can be put on a plate that can be easily read and can then be screwed upon the drill in any convenient position).

can be executed and correspondingly better results attained.

One plate should be on the saddle just below and parellel to the bottom of the cone. This plate should have a degree scale with the figures stamped upon it running 40 degrees each way from zero. A groove should be filed on the cone, so that an easy and rapid reading can be made. A like plate should be placed on the saddle, having a degree scale, passing partly around the arm, so that a reading can be made from the arm or column where a deep groove has been made to act as a point or place of reading. A table as shown in Fig. 1 should be screwed on to the drill anywhere it can be easily read and referred to. This will give the basis of a system for the proper pointing of holes in a given standard round. From it the holes can then be placed with accuracy, and if the round is properly planned, a high efficiency result can be expected.

With the described combination of plate and scale, the machine man has been furnished the needed requirements or "conditions" with which to apply, in a scientific manner, the blueprint round which has from careful tests proved to be the most efficient under the conditions, and, therefore, much has been added to the efficiency of one of the three C's, namely "conditions," and by adding to the efficiency of conditions, efficiency of "co-operation" is promoted, and in turn "confidence efficiency," resulting in a net efficiency that is far above that which has prevailed in the past.

In the use of the plate, Fig. 1, the miner can readily get the information which he requires by following the instructions thereon, namely, "Look along the line opposite depth of hole wanted to column under degree needed, and the figures above the line state the distance the bottom or end of the hole will be shifted or deflected at that angle and depth, while the figures below the line state the added depth that hole must be extended in order to reach the full depth of the proposed round. In drilling the center cut holes start double the distance apart, as shown on the table, to make them intersect." Or, more briefly, "Look along line opposite depth of hole wanted, to column under degree needed. The figures above the line state the distance. The bottom or end of the hole will be shifted or deflected at that angle. Figures below show added distance necessary to extend hole to full depth of proposed round."

A Practical Example

For example, in proposed 4-ft. round cut holes 22 degrees, 4-ft. hole at 22 degrees would be deflected 1 ft. 8 in., and 4 in. must be added to make the hole reach the full depth of the proposed round. Another cut hole, if run at the same degree, should be started double the deflected or shifted distance, or 3 ft. 4 in. from the first hole, in order to meet, or if one cut hole was drilled at 22 degrees to meet a cut hole drilled at 16 degrees, it should start 20 in. plus 14 in., or 34 in. from the 16-degree hole, in order to meet. Aside from the center cut holes, the table is used to "spot" and "point" all the remaining holes, so that each hole is doing its share of the work and no more.

A simple device that can be used to get a reading on a jackhammer or a stoper is to put a pin into the side of the drill, having a small hook on its outer end, and to attach a small scale a few inches below it. The miner hangs a pointer on the pin when he starts the stoper or jackhammer, holding the drill carefully, at the required angle, until he gets the hole started. Then he unnooks the pointer and puts it into his pocket, ready for future use. Of course, this is a simple and crude method, but it will do until something better can be devised, and beats "guessing."

The Lack of Standard Parts

Perhaps one of the most annoying and exasperating things about rock drills, as they are turned over by the manufacturer to the mine management, is the premeditated policy of trying to make the mine manager purchase the manufacturer's line of drills and connections, each manufacturer making his connections different from the other fellow's, so that all attempts to test out other drills will be hampered as much as possible. The mine managers of the country should insist that this policy be stopped and that the different drill companies come together and decide upon a standard line of connections, and if any drill company fail to adopt the line, that company's drill should not be purchased under any conditions until the manufacturer changes his policy. It is to be hoped that some day there will be national and international standardization of scores of articles, such as screw-threads, nuts, bolts, and other parts; but the manufacturers must be compelled by the consumers to adopt these standards.

Pacific Island Phosphate Deposits

One of the Marshall Group, Seized From Germany, Said to Have Supply Which Will Last World for 200 Years

ACCORDING to a memorandum laid on the table of the New Zealand House of Representatives by the President of the Board of Agriculture, the reserves of phosphate of the Island of Nauru, in the Pacific, are sufficient to meet the demands of the world for 200 years. Information obtained from a reliable source, says the Board of Trade *Journal*, indicates that from 80,000,000 to 100,000,000 tons is available, and possibly more. The phosphate is said to be of the highest grade (85 to 86 per cent), and it is claimed that this island contains the largest known quantities of high-grade phosphate in the world. The present output of the island has been somewhat hampered by the war, but the average yearly production is about 150,000 tons.

The island referred to in the preceding paragraph, which is taken from *Commerce Reports*, is no doubt that sometimes known as "Naru," one of the Marshall group, situated just north of the Equator at about 170 deg. East longitude. Before the Great War this was a German possession, but it was seized, it is understood, by Japan, and is now under the control of that country.

There are several phosphate islands in the Pacific, these including Ocean Island, where the Pacific Phosphate Co. has the mining rights, this company also holding an interest in a French company which works the Makatea Island deposits; Christmas Island; Angaur Island, which, according to a German authority, contains 2,500,000 tons ranging from 81 to 83.6 per cent, though another authority places the available phosphate between 300,000 and 600,000 tons; Surprise Island; Clipperton Island; Walpole Island, and Malden Island. Christmas Island, referred to above, must not be confounded with an island of the same name near Java. The deposits have their origin in guano, which is often leached, thus phosphatizing the underlying rock.

Jackhammer Type Drills in Witwatersrand Mines

Shortage of Labor Has Occasioned a More General Adoption of Jackhammers and Small Piston Drills to Stoping Problems on the Rand—Machine Drilling Practice Requires Systematic Instruction

BY E. M. WESTON
Written exclusively for *The Journal*

THE shortage of native labor which has been experienced by the Rand mines during the war period, owing to the ravages of influenza, which destroyed about 100,000 natives south of the Zambezi River alone, shows no sign of lessening. Other causes of labor shortage were attributable to conditions in Portuguese East Africa. There the natives were apparently ready to rise against the Portuguese as soon as the Germans supplied them with rifles and ammunition, and a

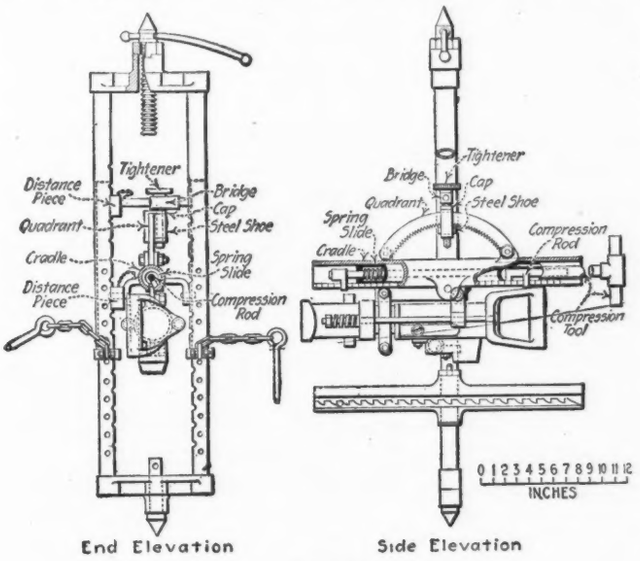


FIG. 1. FISHER'S RIG

rebellion broke out that led to a sanguinary struggle. Again, thousands of natives were impressed as carriers by the Portuguese, German, and British forces, and the mortality among these was high, so that the efforts of the Witwatersrand Native Labor Association failed to supply the usual quota of native mine workers. Diamond mining showed a revival, also attracting native labor, and agriculture has been making rapid strides all over South Africa. For these reasons mine operators were forced to again consider the question of a small stope drill.

Two factors had operated in the past against the extensive use of the jackhammer type drill in stoping. One was the comparative cheapness of hand drilling by the natives and the other the character of rock and the dip of the reef to be worked. Jackhammers have always been used where vertical or nearly vertical holes could be put down; but it was quite another problem to procure a worker who could collar a hole in a narrow stope, often in a nearly horizontal direction or even looking up, and hold the drill and steel so steady that the alignment of the hole was not lost. The local inventor has been busy in attempts to solve the difficulty.

M. F. Roberts, consulting engineer to the Transvaal Chamber of Mines, has established a department in charge of J. H. Veasey to study this question and note where real progress has been made. The department has now issued an interim report describing the apparatus in use. The problem has been to find a light and portable rig for setting up and operating a jackhammer drill.

The first rig described is Fisher's, as shown in Fig. 1, which is nearly self-explanatory. The principal parts of this rig are the bar, weighing 32 lb.; the cradle, 19 lb., and the spring slide, 7 lb., a total of 58 lb. The length of the bar is 33 to 50 in. over all. It is set up without wedges by driving the pivots into foot and hanging walls. The "spring slide" is a cylinder 15 in. long by 1½ in. outside diameter and 1⅛ in. bore. Attached to the spring slide is a web which projects through the slot of the cradle, and to it the jackhammer is attached. Feeding is performed by means of a helical spring, which is put under compression by pressing on the projecting handle. Turning the handle one way engages in the ratchet, thus holding the drill up against the rock and pushing forward as required. Turning the handle the other way releases compression, and the drill can be drawn back.

With such a rig it is claimed that one native can set up and start drilling in five minutes. The operators of the Ferreira Deep Gold Mining Co. hope to attain an efficiency of nine holes per shift. The number called for

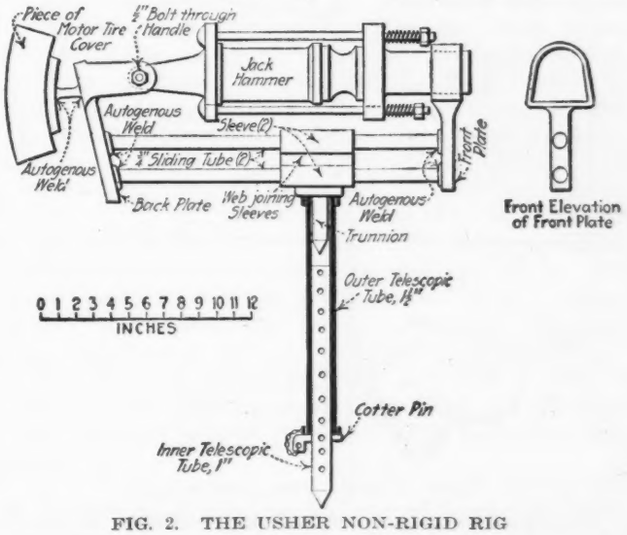


FIG. 2. THE USHER NON-RIGID RIG

at present is forty-seven holes per week, or nearly eight holes per shift. During January, 1919, the average was 6.7 holes having an average depth of 42 in., and a total breaking cost of 6s. 6d. per ton. This included a charge of 2s. 6d. per machine shift for maintenance and 2s. for underground pipefitting.

The Usher rig, shown in Fig. 2, is designed to support the weight of the machine. The device is non-

rigid, and the operator is not entirely relieved of reaction from the machine, nor does the rig assist the maintenance of horizontal alignment. A section of scrapped motor tire is used for a shoulder piece. Results obtained in the use of this machine show an average of six 36-in. holes per machine shift.

The Malpage rig, which is used in the Simmer Deep mine and is shown in Fig. 3, is designed for the purpose of rigidly mounting a jackhammer on an arm and bar, thus relieving the operator of all effects of vibration and reaction. The specially designed light mountings enable one native to run one machine, and air pressure is used to feed the jackhammer up to its work. The bar and arm are set up in the usual manner, and the trunnion of the cradle is placed in the clamp. For collaring a hole a steel steady rest is supplied. This is fixed to the front end of the cradle, supports the steel half way, and is removed when the hole is started. The size of air-feed cylinders is varied according to the dip of the stopes. A native accustomed to the drill can rig up in ten minutes. Compared with jackhammers used in the same mine, but held by hand, there is a gain of 28 per cent in footage drilled, and the holes are 58 per cent deeper when the device is used.

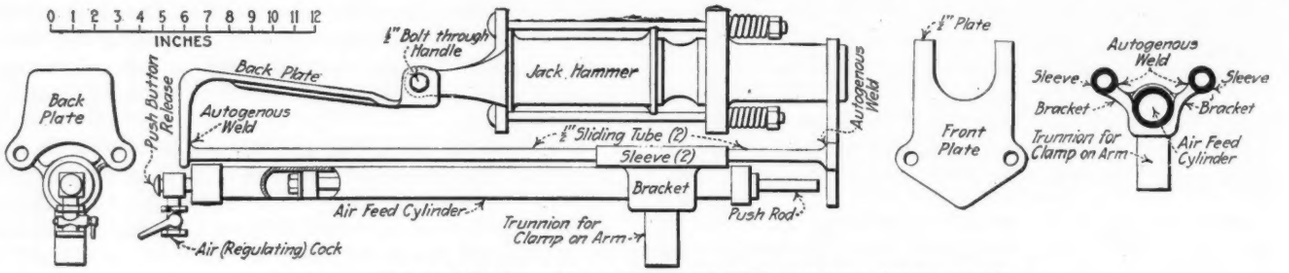


FIG. 3. THE MALPAGE RIG AS USED IN THE SIMMER DEEP MINE

The Kendall rig, as shown in Fig. 4, is now employed in the Consolidated Langlaagte mines. To use the contrivance, the hole is collared with a short starter, the operator holding the machine. When a depth of six to seven inches is reached, the nose of the rig is driven in over a starter and drilling begins. Natives using the trough frequently rest the back end on arm, knee, or thigh. In the City and Suburban mine a light bar is used to support the end, and it is suggested that two hinged telescopic legs attached to the rear end would prove satisfactory. About five holes, ½-in. diameter and 42-in. deep, have been drilled per shift.

The Nye and Coleman rig was first used by myself in No. 2 shaft at the State mines, and is referred to in my book "Practical Mining on the Rand." The device is an adaptation of a quarry bar to underground conditions, and, if the stope is worked in a proper manner, it has advantages over all the other rigs used for flatter stopes.

An interesting experiment is being carried out in No. 5 shaft, Crown Mines. At this property 51 jackhammers are in use, held in the hand or provided with supports of the Usher types, and these machines are using steel without collars. Mr. Veasey's report states in this connection: "Without collars or shanks it is necessary for the operator to hold the jackhammer exactly in the right position. If he pushes too hard he overfeeds and shortens the stroke and the steel ceases to rotate. If he fails to push sufficiently hard, the piston hits the front of the machine. It is between these two limits that the operator has to work, which naturally increases the physical strain. It is stated by the officials in charge that no difficulty is experienced in operating jackhammers without collars of steel, that

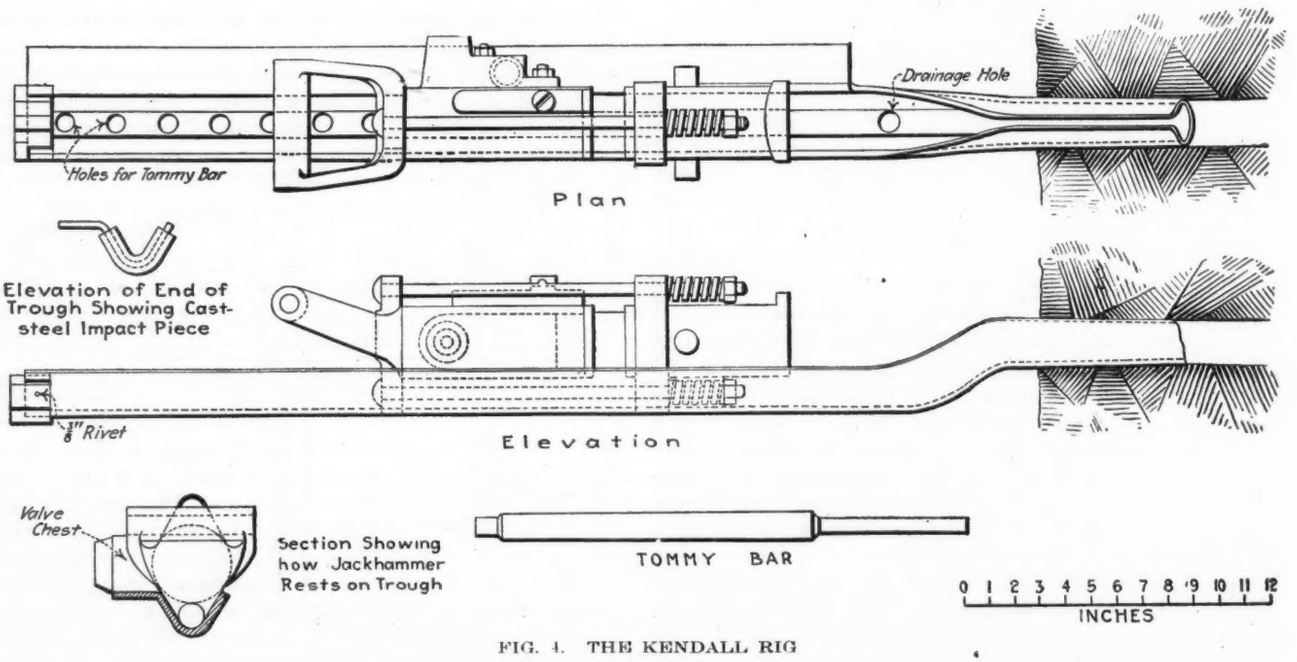

Drainage Hole
Holes for Tommy Bar
Plan
Elevation of End of Trough Showing Cast-steel Impact Piece
⅜" Rivet
Elevation
Valve Chest
Section Showing how Jackhammer Rests on Trough
TOMMY BAR
0 1 2 3 4 5 6 7 8 9 10 11 12
INCHES

FIG. 4. THE KENDALL RIG

no loss of efficiency has been apparent, that no complaints have been received from operators, and that, in fact, they cannot detect any difference between the results obtained with collars on shanks and without collars on shanks. No definite test has, however, been made. In the matter of disadvantage, in addition to increased strain on operator, careful observation suggests that there must be a loss in drilling speed, which may amount to 20 to 25 per cent, due to the operator having continually to find the place where his machine drills best."

Mr. Veasey continues, "The light stoping machines dreamed of twelve years ago are in existence today, weighing 40 lb., feeding water axially through the steel and drilling two inches per minute.

"If the industry is to receive a full measure of benefit from these improvements, the latter in turn must receive fair treatment in the way of lubrication, protection from injury and from dirt, an ample supply of good steel, and operators who understand their manipulation. So far as one has been able to observe, maximum results are not by any means being obtained from jackhammers, either as regards the amount of work performed by them or the cost of such work."

The following are examples of what can be done: At the Simmer Deep mine the demonstrator with the Malpage rig can drill twelve 48-in. holes in a shift on three or four benches; at the Ferreira Deep mine a native demonstrator with Fisher's rig can drill twelve holes, a total of 480 in., in one shift, and at another mine one jackhammer drilled twenty-one holes in a total drilling time of 4 hours 50 minutes, the average time per hole being 13.8 minutes; total footage, 78 ft. 5 in.; average depth of hole, 44.8 in.; and the average rate of drilling, 3.23 in. per minute. At the same mine one operator drilled fourteen holes per shift for a week.

Drawbacks to Adoption of Jackhammer Type Drills

Various suggestions are made with a view to increased efficiency, the most important being that both native operators and white supervisors be given some systematic instruction in their work. Unfortunately, in most Rand mines the details necessary to obtain efficiency are not given proper attention. Machines are left about to get rusty and dirty, benches are not cleaned and ready for the operator, and lubrication is neglected. Delays take place owing to interruptions and breakages to air and water supply. The average miner in most cases has neither spares, initiative, tools, nor skill to attend to such matters himself, but he sits down and waits until the pipefitter is sent for from some remote part of the section. Since acetylene became expensive there has been a lack of proper illumination.

The maintenance cost of jackhammers is a heavy item, and in most cases exact costs are not kept, and consequently figures cannot be given. Chucks are kept in use when they should have been discarded. This has always been a source of inefficiency since air-feed rising drills were introduced. Not only is there the loss in efficiency in starting and drilling a hole, but worn chucks mean excessive wear on shanks, which in turn produces excessive wear on the next set of new chucks and decreased efficiency again in starting and drilling. Pistons also become worn and broken from striking the steel obliquely. Shanks of steel are not properly prepared. Mine blacksmiths have an incurable tendency to round and champ the ends, so that the area of contact to receive the blow of the piston is reduced to a dangerous extent. It is suggested that a Tappat machine would have several advantages, despite a possible loss of 20 per cent in drilling speed.

From the report, there seems to be an opening for the use of jackhammers on a bar rig for development work where the maximum speed of advance is not necessary. It is the practice on the Simmer Deep to use three jackhammers in a 7 x 6 ft. drift with air-feed cradles mounted on two bars. The longest steel used is 5½ ft. over all. The number of holes per round is twenty-two and their average depth is 48 inches. The author of the report is of opinion that, in view of the fact that the native hand driller also does shoveling work for two hours in addition to other work, and when all proper costs are charged against hammer drills, including interest and redemption on the capital cost (estimated at about £200) for installing a jackhammer, a jackhammer must drill at least seven holes 36 inches per shift to compete with the native driller.

Copper Deposits in Ireland

Ireland is not often thought of in connection with copper production; but it was once the scene of an extensive industry. In 1836, a total of 21,819 tons was exported to Swansea, and valued at £163,900.

Copper is recorded as found in 280 places in Ireland. It is reported there are considerable deposits in the West of Ireland. In the past, mines were worked in Wicklow, Waterford, and Cork, the copper occurring in clay slate. The main belt runs from near the sea south of Wicklow in a southwesterly direction to Avoca, and thence to Krogan and Kinsella, a distance of about fifteen miles. Lead, silver, iron, and copper have been mined.

In 1840 the principal product was sulphur, obtained from the pyrite, copper being recovered from the roasted residue. Gold was present, and went to the smelters, no doubt, as did the gold with the copper ore of Cobar, in New South Wales, for many years. Copper pyrite and grey copper ore were the copper minerals. In 1836 the yield from the ore mines in the Wicklow district was between 4 and 9 per cent Cu, and 11,813 tons was sold to Swansea. The mines worked in Bunmahon, County Waterford, produced 3,588 tons of copper ore in 1836, valued at £33,166. In 1843, a total of 9,101 tons was produced. Here the lodes are exposed in the cliffs on the seacost, and some are of good width. The average value of the ore was 7½ per cent Cu. The Allihies mine, in County Cork, has been worked for 800 ft. in length and 1,100 ft. in depth. The lode was 60 ft. wide in one place. The ore contained about 10 per cent Cu, and other mines produced in 1836 a total of 6,418 tons, valued at £74,879. An operator experienced in copper mining is now reopening this mine.

In the metamorphic and granite rocks of Galway, in the far west, various deposits of copper, sulphur, lead, and zinc have been mined in a small way. Some years ago an Irish company with small capital started work at Beaupark, near the Boyne. The mines became flooded, and work ceased without proving anything. The engineers of the Ministry of Munitions have been examining old mines in Ireland, as well as in Great Britain. They were of the opinion that the Avoca group could be reopened during the war with some prospect of success.

Separating Metallics From Pacific Coast Sands

War Demand Produces Development of a Process for Concentration of Chromite, Zircon, and Numerous Other Minerals—Tabling Is Followed by Magnetic Separation—Analyses of Products Obtained

BY HENRY E. WOOD
Written exclusively for *The Journal*

DURING the war the demand for chromium was urgent, and its production in comparatively large quantities was so consistently urged by the U. S. Government that a largely increased output resulted from the producing mines, and the development of new sources was stimulated. On account of the sudden failure of the demand at the termination of the war, and the decision of the Government under the War Minerals Relief Act, the expectations of many individuals were not realized, and no adequate return can now be expected from the large amounts of capital invested. Looking at the subject from a metallurgical point of view, however, the problem was one of considerable interest and great fascination.

DEPOSITS HAVE LONG BEEN KNOWN

Possibly the largest amount of chromium "in sight" today is contained in the "black sands" of the Pacific Coast, which exist for many miles along the shores of California, Oregon, and Washington, where they are plainly exposed, not only at the present beach line, but also on the ancient sea levels, which are in view, in some regions, for several miles inland. For many years these sands have attracted the attention of miners, on account of their gold and platinum contents, and in many places sufficient evidence is present to warrant attempts to recover them. For over two hundred miles, as I know from personal experience, few localities exist where, by careful panning, one cannot obtain attractive showings of fine, flake gold and occasional scales of the harder platinum. The gold is in an exceedingly fine state of division, but satisfactory methods for its recovery have been demonstrated. As severe storms are of frequent occurrence, most of the equipment erected for such purposes has been wrecked, as is plainly evident to the visitor.

Disintegration of the serpentine formations in regions back from the coast, erosion, and wave and tidal action for unknown ages have been the prime factors in a concentration of all the heavier minerals, the hardness of these minerals also playing an important part. Naturally, the ratio of concentration is unknown, but undoubtedly it is a high one, possibly several thousand into one. A rough classification of the minerals is also evident from the fact that, of the sands which have been worked, all of the minerals sought are practically of the same size, 75 per cent of their total weight being between 70 and 100 mesh.

METHOD OF CONCENTRATION

A practical method of treatment for the minus-40 mesh sands has been developed, the first step of which is to pass them over a Wilfley table. If gold and platinum are present, they are virtually all recovered by cutting out the extreme upper edge of the concentrate and making a concentration ratio of one hundred or more into one. On the tailing side of the table most of the free quartz is eliminated. The middling, which in this particular case constitutes about 90 per cent of the material treated, is dried and passed through a magnetic separator of the Dings type to remove the highly magnetic minerals. The remainder is treated in a separator of the Wetherill type, to recover minerals of a lower magnetic permeability. Although these magnetic concentrates contain magnetite, ilmenite, several varieties of garnet, chromite, sometimes small amounts of monazite, and nearly always above 2 per cent by weight of zircon, they can all be delivered as separate commercial products and in one continuous operation.

The composition of the various products is shown in their partial analyses herewith. Both the magnetite and the chromite are practically free from titanic iron. The garnets have an average hardness of eight, but as the grains are of globular shape they probably would not have the commercial value of crushed garnet having angular cutting surfaces; they are, however, useful for many purposes. The garnets constitute a byproduct over 20 per cent by weight, and are worth consideration. The chromite, it is said, contains too high a percentage of chemically combined iron to be used for all purposes.

FUTURE SUPPLIES OF ZIRCONIUM LIKELY TO COME FROM SILICATES

Brazil has heretofore furnished the main supply of zirconium from its oxide deposits in San Paulo, but as these oxides are due to the action of thermal waters on the underlying silicates, the deposits may be considered as superficial in their nature and subject to exhaustion. Electro-metallurgy has recently produced zirconium successfully from the silicate, so that future demand for ferrozirconium, in which form the wonderful properties of this metal are utilized, is likely to have the silicate as its base of supply.

My attention was first called to the chromite in these sands in 1904 while making an examination of an abandoned copper mine that suspended shipments to Swansea, Wales, in 1859. The sands were found several miles back from the coast in northern California. Over an area of one or two square miles the hills had a dark-colored sandy capping composed chiefly of garnets and chromite, so that there was but little vegetation. It was evident that the winds had removed the lighter quartz grains. A sample was taken to Denver, where the Wetherill separator gave a product assaying 52 per cent Cr_2O_3. Such an ore at that time was worth only $14 per ton in Baltimore, and with an ocean freight rate of $9.60 it had no commercial value, so it was decided to await the completion of the Panama Canal for further investigations. A few miles farther inland from the locality where these sands were exposed, some ancient open cuts showed chromite in place.

FIVE TONS OF SAMPLES USED FOR TEST

In 1918 a large amount of experimental work was performed on material of the type described, and in order to get fair samples, a total of five tons were taken.

About 200 samples, each weighing 200 lb., were obtained by drilling, and as the holes were carried to a depth of 14 ft., several million tons of material which is readily available was represented.

TABLE I. DRY SCREEN ANALYSIS. SAMPLE FROM ONE SACK

Mesh	Per Cent by Weight	Per Cent Cr_2O_3	Cr_2O_3 Distribution in Per Cent
Plus 40	10.30	1.55	0.89
40 to 50	12.05	7.40	4.99
50 to 60	9.05	7.95	4.03
60 to 70	21.95	18.95	23.29
70 to 80	9.10	23.10	11.77
80 to 100	22.20	25.60	31.83
100 to 120	13.25	28.80	21.37
Minus 120	2.10	15.60	1.83
Total	100.00	Average 17.85	Total 100.00

TABLE II. WET SCREEN ANALYSIS FROM AVERAGE OF ENTIRE LOT

Mesh	Per Cent by Weight	Per Cent Cr_2O_3	Cr_2O_3 Distribution in Per Cent
Plus 40	4.20	2.30	0.44
40 to 50	9.20	6.65	2.77
50 to 60	2.70	9.60	1.18
60 to 70	34.50	20.75	32.43
70 to 80	8.50	27.60	10.62
80 to 100	29.70	29.00	39.02
100 to 120	9.70	29.00	12.74
Minus 120	11.50	11.85	6.80
Total	100.00	Average 22.08	Total 100.00

Two tests (one each from the dry and wet screened sands) were made under the following plan:

1. Rejection of all plus-4 mesh material to eliminate roots and like materials.
2. Rejection of plus-40 mesh sands to eliminate quartz.
3. Wilfley table treatment of the mius-40 mesh material to eliminate quartz.
4. Drying of the concentrate.
5. Wetherill magnetic separations.

TABLE III. CONCENTRATION RESULTS FROM DRY-SCREENED SANDS

	Wt. Lb.	Per Cent by Weight	Ratio of Conc.	Per Cent Cr_2O_3	Cr_2O_3 Distribution in Per Cent
Feed	94.62	100.00	.....	21.30	100.00
Plus 40	6.87	7.26	13.74	3.05	1.04
Minus 40	87.50	92.47	.....	22.20	96.38
Conct	68.00	71.86	1.39	27.25	91.93
Tailing	18.75	19.81	5.05	3.90	3.63
Mag. at 0.6 amp.	2.28	2.40	41.68	7.50	0.84
Mag. at 1.90 amp.	23.69	25.04	4.17	12.35	14.52
Mag. at 3.00 amp.	37.75	39.89	2.50	41.35	77.44
2nd pole	1.59	1.68	59.50	9.80	0.77
Non-mag.	3.68	3.90	25.64	0.15	0.03

Wet concentration of the 3.68 lb. of non-magnetic tailing gave the following results: Concentrate, 2.18 lb.; per cent by weight, 2.30; ratio of concentration, 43.44; zirconia (ZrO_2), 66.15 per cent. (Pure zircon contains 67 per cent.) Tailing, 1.43 lb.; per cent by weight, 1.51; ratio of concentration, 66.16; Cr_2O_3, 0.15 per cent.

The analysis of the chromite product was as follows:

TABLE IV. CHROMITE PRODUCT

	Per Cent		Per Cent
Titanium	Trace	Alumina	25.20
Iron oxide	27.13	Sulphur	0.81
Manganese	1.64	Chromic oxide	41.35
Silica	4.10		
Total			100.23

TABLE V. SCREEN ANALYSIS OF WETHERILL CONCENTRATE

Mesh	Per Cent by Weight	Per Cent Cr_2O_3	Cr_2O_3 Distribution in Per Cent
Plus 50	1.50	39.60	1.45
Plus 60	2.80	41.45	2.83
Plus 70	24.40	40.50	24.14
Plus 80	10.40	40.60	10.32
Plus 100	41.70	40.75	41.51
Minus 100	19.20	42.10	19.75
Total	100.00	Average 40.95	Total 100.00

TABLE VI. SCREEN ANALYSIS OF GARNET PRODUCT

(12.35 per cent Cr_2O_3)

Mesh	Per Cent by Weight	
Plus 60	8.0	
Plus 70	42.3	
Plus 80	11.7	
Plus 100	29.2	
Minus 100	8.8	= 1.79 per cent of original. Assays 17.4 per cent Cr_2O_3
Total	100.0	

TABLE VII. CONCENTRATION RESULTS FROM WET-SCREENED SANDS

	Weight in Lb. and Per Cent by Weight	Ratio of Conc.	Per Cent Cr_2O	Cr_2O_3 Distribution in Per Cent
Feed, plus 40 m	4.25	23.52	1.40	0.28
Feed, minus 40 m	100.00	.....	21.00	100.00
Conct	79.50	1.25	25.90	98.05
Tailing	16.25	6.15	1.50	1.16
Mag. at 0.15 amp	1.45	69.68	5.60	0.39
Mag. at 0.80 amp	1.85	54.54	9.50	0.84
Mag. at 1.90 amp	23.75	4.21	7.45	8.43
Mag. at 2.80 amp	43.75	2.28	39.60	82.50
Mag. at 5.20 amp	2.38	42.10	12.10	1.37
Non-mag. tailing	6.32	15.81	0.75	0.22

ANALYSES

Concentrate from non-magnetic, ZrO_2, 40.79 per cent.

Concentrate from reconcentration of magnetic chromite (sample of best part): Cr_2O_3, 44.90; FeO, 27.53; MnO, 1.64; SiO_2, 3.60; Al_2O_3, 22.10 per cent.

Magnetic at 0.15 amp.: Cr_2O_3, 5.60; FeO, 53.84; SiO_2, 1.90; TiO_2, 28.10 per cent.

Magnetic at 0.80 amp.: Cr_2O_3, 9.50; FeO, 56.50; SiO_2 2.50; TiO_2, 27.70 per cent.

Kurnal R. Babbitt Dead

KURNAL R. BABBITT, an attorney for many years identified with mining and with the great copper companies, died on Jan. 24 at his home, 15 East 78th St., New York City. His death was caused by a complication of diseases, from which Mr. Babbitt had suffered for nearly a year.

Mr. Babbitt was born in Salem, Mich., in 1864, and received his legal education at Columbia University, now George Washington University. He entered the service of the Post Office Department at Washington, after leaving the university, and served that department until 1891. In that year he began the practice of law at Aspen, Col. Soon after the great gold strikes at Cripple Creek, Mr. Babbitt went to that camp, opening a law office there, and began to interest himself in the business of mining as well as mining law. Mr. Babbitt's specialized knowledge of mining law, which he acquired during the course of his practice in Colorado, drew to him as clients many of the largest mine owners and mining companies, and in 1908 he left Colorado and came to New York City, where he had an extensive practice.

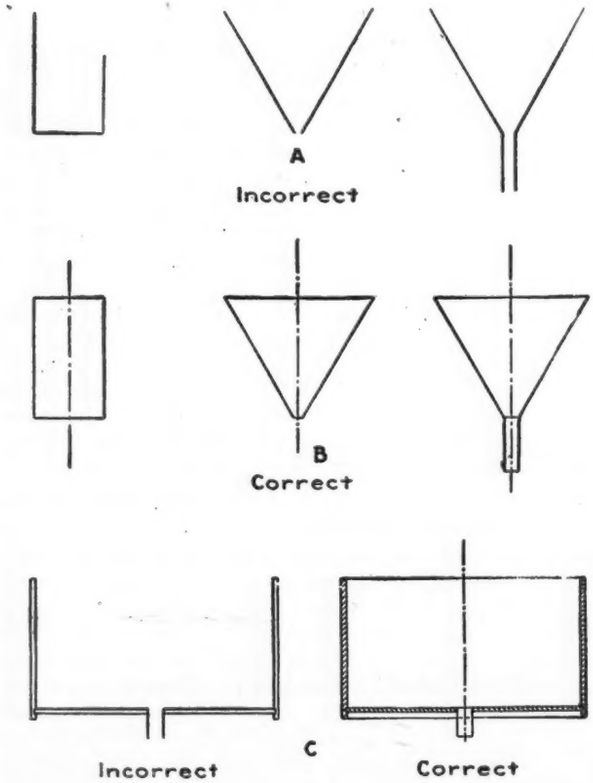
Mr. Babbitt married in 1895 Miss Lucy Cullyford. Mrs. Babbitt and their three children survive him. Funeral services were held on Jan. 25 at St. Bartholomew's Church, New York City. Burial was in Michigan.

Rails Made of Manganese Steel have found considerable application for curves and in special work on both electric and steam railways. Many engineers have decided, however, that for plain curves the conditions must be extremely severe to warrant the expense of manganese instead of bessemer and openhearth steel, even at pre-war prices.

Mechanical Drafting in Mining and Metallurgy

By H. E. West

All engineers make use of mechanical drafting, for the delineation of mining, metallurgical, or mechanical details, and more often than not a lack of technique is displayed. I therefore purpose to suggest briefly how



some of the more common forms of incorrect drafting may be avoided.

For instance, the sketch "*A*" can portray nothing definite, whereas "*B*" correctly represents a cylinder, cone, and funnel. Again, many technical books frequently use the incorrect form shown in the sketch "*C*," which, practically, is meaningless. The corrected form shows a tank with pipe connection in section. Attention should be particularly given to the bottom line which corresponds to the top line of the tank.

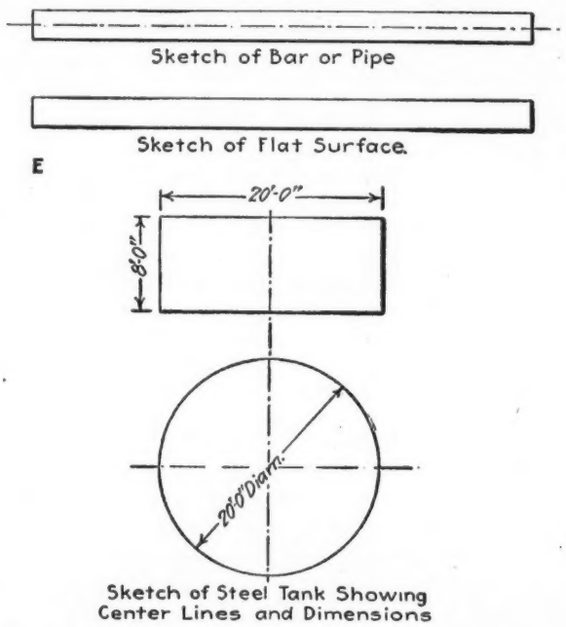
Granted that these fundamentals are correct, the examination of an ordinary mining plan, such as in "*D*,"

intended to represent a prospect showing an adit and prospect shaft, shows the first section, to a mechanically trained eye, incorrectly; as, being in section, the back and entrance of both the adit and bottom and top of shaft require a line denoting the surface, which is continuous.

As shown, the interpretation is indefinite, whereas the corrected form more accurately portrays the development.

Again, in center lines, the convention adopted is by a long line with dot. A center line inserted indicates a cylindrical surface, whereas without a center line the surface is flat, as in a bar, as in "*E*."

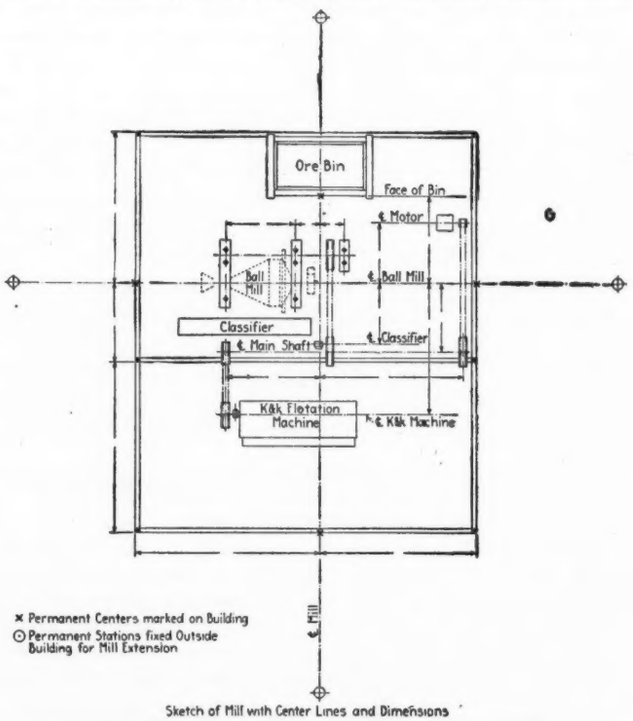
Dimensions are preferably inserted over the line, as



Sketch of Steel Tank Showing Center Lines and Dimensions

in "F," although it is correct to insert the figure between the broken line.

Applied to mill designs, center lines and dimensions become of the highest importance, and dimensions should always be tied in to such centers, which are definite and fixed, and, usually, permanently marked. These should never be tied to any movable object, such



Sketch of Mill with Center Lines and Dimensions

as the walls of a building. Attention is drawn to sketch "*G*," which indicates both center line marks registered on the building and also permanent stations, for possible enlargement, well outside the building.

January Mining Dividends

Mining dividends paid in January, 1920, by 19 United States mining and metallurgical companies amounted to $4,947,776, as compared with $9,294,622 paid by 27 concerns in January, 1919.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Smelters, pfd. A	U. S.-Mex.	$1.50	$146,071
Am. Smelters, pfd. B	U. S.-Mex.	1.25	39,855
Ariz. Silver Mines	Nev.	.03	13,500
Caledonia, l.s	Ida.	.01	26,050
Camp Bird, pfd. g.s	Col.	.18	110,501
Daly, l.s	Utah	.10	15,000
Dragon Cons	Utah	.01	18,750
Golden Cycle, g	Col.	.03	45,000
Inspiration, c	Ariz.	1.50	1,772,951
Iron Blossom, l.s	Utah	.02½	25,000
Phelps Dodge, c	U. S.-Mex.	2.50	1,125,000
Portland, g	Col.	.02	60,000
Shattuck-Arizona, c	Ariz.	.25	87,500
Tonopah Belmont, g.s	Nev.	.05	75,000
Tonopah Ex., g	Nev.	.05	64,140
United Eastern, g	Ariz.	.21	286,230
United Gold Mines	Col.	.01	40,000
U. S. Smelting, com	U. S.-Mex.	1.50	526,673
U. S. Smelting, pfd	U. S.-Mex.	.87½	425,555
Vindicator, g.s	Col.	.01	15,000
Wolverine, c	Mich.	.50	30,000

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Asbestos Corpn	Que.	$7.00	$210,000
Asbestos Corpn, pfd	Que.	8.00	320,000
Belmont Surf. Inlet, g.s	B. C.	.05	125,000
Cons. Min. and Sm., c.z.l	B. C.	.62½	261,936
Dome Mines, s	Ont.	.25	100,000
Howe Sound, c	Can.-Mex.	.05	99,208
McIntyre, g.s	Ont.	.05	182,014
McKinley-Darragh-Savage, s	Ont.	.03	67,431
N. Y. & Honduras Rosario, g. s	C. A.	.50	100,000
Nipissing, g.s	Ont.	.50	600,000
Santa Gertrudis, g.s	Mex.	.24	364,500
Temiskaming, s	Ont.	.04	100,000

Canadian, Mexican and Central American companies paid $2,530,089 in January, 1920, and $1,543,075 a year ago.

No holding companies reported payments last month, nor were there any features of special interest, except the resumption of dividends by the Dome Mines, which had not paid since 1917, and the beginning of quarterly disbursements by United Eastern.

Mineral Museum at Panama City

Brother Heliodoro, director of the Colegio de La Salle at Panama City, Panama, writes that this well-known institution will enlarge the mineral and ore collection of its museum. In carrying out this project the director asks the principal mining firms of the United States to contribute free samples of their minerals and products to the college collection. In support of his request he points out that the school museum was awarded six diplomas by the judges of the Panama Exposition of 1915, that it is well and favorably known throughout Panama and Central America, and that many people from almost every nation of the world pass through Panama City annually, most of them visiting the museum en route.

Brother Heliodoro is quite justified in pointing out the advertising value of a well-chosen, carefully labeled, and attractively displayed collection of United States ores and minerals, accompanied by samples of the commercial products derived from them, when thus placed before the cosmopolitan body of visitors to his museum. Such a display at this great focus of the world's trade should contribute to a more widespread knowledge of our wares and resources, and materially assist in the extension of our overseas trade.

The names and addresses of the mining firms that sent samples of minerals to the Panama Exposition are also requested, that Brother Heliodoro may get into direct relations with the respective managers. We take pleasure in bespeaking an enlightened and generous response to both requests.

On our own behalf, this seems an opportune occasion to suggest that Brother Heliodoro's move deserves careful and thoughtful consideration also at the hands of other American industries. Panama City, or a neighboring locality, may well be carefully considered as the site of a permanent industrial exposition of many industries and products of the United States. Such expositions were and are still carefully maintained by other leading commercial nations, and a carefully selected series of exhibits designed to appeal to the special classes of travelers passing through Panama might well prove of the greatest commercial value to our country.

Australian Copper Smelters Resume Operations

Smelting operations have been resumed by the Hampden Cloncurry Copper Mines, Ltd., in Queensland, and by the C. S. A. mine at Cobar, New South Wales, according to *The Ironmonger*. The latter company employs about two thousand work people.

Considerable quantities of low-grade basic ore are awaiting treatment, which are to be utilized not only for smelting the company's siliceous ore, but also ores from neighboring mines, such as the Gladstone and the Budgery. Important alterations have been made in the smelting plant since the C. S. A. mine closed down in March last. The two blast furnaces now have an individual capacity of from 1,400 to 1,600 tons a week, and more powerful blowers have been installed. Matte of 40 to 50 per cent copper will be made and forwarded to the C. S. A. refining works at Kandos, on the Mudgee line, where the C. S. A. has expended over £35,000 on an electrolytic plant and a reverberatory-furnace plant. The capacity of the plant is 2,500 tons of electrolytic copper per annum. For the time being the company will produce blister copper only, the refining process being completed by the Electrolytic Refining & Smelting Co. of Australia, Ltd., at Port Kembla.

The Mining Index

During the period of publication of *The Journal* in San Francisco it was found necessary to discontinue temporarily the index of current mining and metallurgical literature. It is resumed in this issue, and will appear regularly hereafter in the first issue of each month as usual. It has not been practicable to include all of the references which would have been published during the months which were missed; the aim has been to select the more important items. Beginning with the next issue the Index will be up to date, and it is our plan to make every effort to bring to our readers' attention in a convenient, well-classified form every important article in the technical press, or paper before technical societies, including also bulletins of the United States and foreign governments.

Books on mining, metallurgical, or allied subjects are reviewed promptly in *The Journal*, and important patents are listed regularly. Thus, by reading *The Journal* one may be informed promptly and efficiently regarding the important literature on any subject connected with the industry.

THE PETROLEUM INDUSTRY

The Petroleum Situation

A One-Act Episode

Scene: Any club. Atmosphere of smoke. Leather armchairs. Through a door in the background a bar is seen, overgrown with cobwebs. Clatter of cheerful discussion of war, bolshevism, politics, and science—but not religion.

Enter on the left a Government Official; throws himself wearily into a chair; orders tea and crackers. Directly after, enter from the right a Mining Engineer, in a hurry. Spying Government Official, he throws off his overcoat, pulls up his chair, and orders near-beer and cigarettes.

Mining Engineer: Say, about this petroleum situation. Let us assume—and of course I know it to be true—that the supremacy of the United States in petroleum is in danger; that England has formed or fostered a government-controlled British oil combine and is actively campaigning for the world's petroleum; and that she is making such progress that she is likely to become as supreme in petroleum as she is on the seas; assume all that. What are you fellows going to do about it? England, as I gather from Senator Phelan's communication to the Senate, from the report of the Director of the Bureau of Mines, and from the *Engineering and Mining Journal*, is furthering her plans by discriminating against foreigners (including Americans) in the oil-bearing regions which she controls; while she is strengthening her holdings even in the United States, which has no defensive, or aggressive —or, may I not say, intelligent?—petroleum policy. Shouldn't the United States get busy?

Government Official (wearily): Well, you know as well as I do that our Government is in the doldrums right now. We might as well not have any Government. Both warring elements want to wear the trousers. One has hold of one leg, and the other of the other; the question is no longer who will wear the trousers and go out and saw the wood, but how long before the trousers will split up the middle, and nobody will be in a position to go out into the world of foreign relations. That's where our Government is at a disadvantage with a more logical democracy, like England and France. Over there one party gains a majority at the elections, and at once the old political leader, if of a different faith, gets out, and the dominating party has its own chief. So things go on humming, down one alley or another. But here —paralysis! It wouldn't look well in print, and I understand it's a jailable offence under our proposed sedition acts, but it's a serious defect in our Constitution. Over there a majority vote at each new crisis determines not only the character of the legislators but that of the national leader as well. Over here the national leader is unbudgeable, no matter what the country thinks, and for the last few administrations there has been a tendency for him to try to force the legislators along his own personally chosen path. This difference is between the democratic tendency, as in France and England, or in Canada, and the autocratic tendency, such as we have.

Mining Engineer: I am not interested in your private grouch against the Government, and I don't care what your politics are. I was asking you about petroleum. What *should* be done, then, if I have to put it that way? Should we close the oil fields of the United States to British capital, as a fair retaliation? That, I believe, has been proposed; and it looks only fair to me. But what about Mexico? There's the three-cornered fight down there between American oil companies, British oil companies, and the Mexican government. That is really more important to us than our own fields. It appears that the British companies have a better standin with Carranza, and are getting on top. More than that, I understand that while all this talk has been going on, British capital has secured such enormous exclusive concessions for prospecting for oil in South America and elsewhere (not to say Asia, where the success of the British policy has for a long time been publicly known), that the United States is already practically out of the running. What *should* we say to England?

Government Official: Well, now, I'll be honest and say that I believe England is within her rights—her leaders have done what we would advise if we were Englishmen. England has practically no oil; she must get it abroad. Her empire is world-wide. She cannot hold it together unless she is mistress of the seas; she cannot be mistress of the seas from now on unless she has plenty of oil, and oil bunkering stations all over the world, for her navy and her commerce. That explains the necessity of her mad scramble for oil.

Mining Engineer: But her methods—that's what rather worries and puzzles me. Over there it's the government at the head of the combined oil interests. No wonder they are beating out the American, but what does it mean to the British? Isn't it State Socialism?

Government Official: Call it by any name you like. As a matter of fact it is. But England had no choice. Before the war, her democracy was individualistic, like that of America. Germany, with her developments in government-controlled industries—in State Socialism, in short—proved the superior efficiency in that system. She nearly put England and the rest of us out of business, not because the average German is above par or especially efficient, but because of the efficiency of German state-controlled mass methods. England, awake and horrified, knows that the end has not come—that the world is at the beginning of a tremendous competition for wealth and power. She sees she must fight with the same weapons, or perish. Just as the militarism of Germany and France forced England and America and the world to become militaristic or perish, so the German plan for industrial preservation and conquest has been forced not only on England, but on France and other European countries. We were forced to it also during the war. The difference is that we have sloughed off, in a hurry, not only militarism, but state control of key industries, with the war; while

England and Europe in general have retained them. They have to. The struggle between Germany and France for the iron of Alsace-Lorraine developed methods of massed militarism and massed commercialism as weapons of battle which will dominate the world, thoroughly infected with the spirit of that struggle. As well refuse to adopt long-range siege guns, or submarines—yes, or poison gas, as we found.

Mining Engineer: But it's undemocratic—at least it's un-American! Here we have been crusading against the big business combinations for years. We invented them, and we were afraid of them, and tried to smash them. We broke up our big oil combination, the Standard Oil, with the result that the overhead was increased and with it the price of oil or gasoline to the consumer; but we felt we had done a good deed. England and the Continent, too, damned the American trusts. Now, all of a sudden, they slip this over on us!

Government Official: Well, as I tell you, they had to, as a matter of self-preservation.

Mining Engineer: And what have *we* got to do?

Government Official: We don't have to do anything. We have large oil reserves of our own, although less than we need for our own consumption. We can sit back and take second place to England, with an increasing margin. Why shouldn't we do it? The struggle of each nation to dominate will lead to endless wars.

Mining Engineer: Well, I have a great faith in the destiny of America—and we know that her influence among nations, for good or evil, depends mainly on her power and wealth. If we believe in ourselves, should we deliberately plan to draw out of world politics, without a struggle? Somebody else will run us, if we don't run ourselves.

Government Official: There is only one answer then—the solution that England found for Germany's future offensive—the adoption of the same weapons.

Mining Engineer: You mean State Socialism for America?

Government Official: Can that name! I don't like it. I mean government support and control of American oil interests consolidated and working in unison—a slight extension only of the theory of the Webb export act. That act recognized the necessity for American trusts for external use only, but kept the ban on the internal application. Anyhow, that sort of socialism, or whatever you call it, holds the palm for efficiency. Look at the ant and the bee. They developed socialistic habits ages before man had the theory, and they are certainly efficient and orderly, even if not progressive.

Mining Engineer: And what then?

Government Official: Supposing our Government, with all its oil interests organized and under its wing, should go to the British government, which has been similarly situated for some time past, and should say, "You are all right so far, and we have no kick coming; but it looks as if there was going to be too little petroleum in the world to take care of the expansion of every nation's business, such as they are now planning. Not for us alone, but for the world in general, it's going to be a case of fight, or divide fairly without fighting. Let's get together and divide; let's allocate, in short. We did it as allies during the war. Let's do it now for all time. Everybody will be short, but everybody will get his just share.

Mining Engineer: How about the rest of the world?

Government Official: The rest of the world would come in on the deal. The general policy both of England and the United States has always been square. The problem of the rest of the world would be easily and equitably solved. The great thing is an understanding between England and the United States. There is a lot of foolish feeling in each country against the other. It's dangerous.

Mining Engineer: The people would never stand for it. The labor unions would never stand for it.

Government Official: The labor unions are stronger and more radical in England than in America, and they seem to be standing for it there. Anyway, labor unionism is socialistic in a sense, if you get right down to facts; and it's growing in strength everywhere.

Mining Engineer: Whither are we drifting?

Government Official: Well, take your choice. Have a cigar?

Mining Engineer: No thanks. I'd rather smoke my own brand.

Exeunt omnes.

World's Production of Petroleum

The U. S. Geological Survey has published in its press bulletin for January, 1920, figures of the world's production of crude petroleum in 1918, which, with those for 1917, are given in the accompanying table:

Country	1917 Barrels of 42 Gal.	1917 Per Cent of Total	1918 Barrels of 42 Gal.	1918 Per Cent of Total
United States	(a) 335,315,601	66.17	355,927,716	69.15
Mexico	55,292,770	10.91	63,828,327	12.40
Russia	(b) 69,000,000	13.62	40,456,182	7.86
Dutch East Indies, including British Borneo	12,928,955	2.55	13,284,936	2.58
Rumania	2,681,870	0.53	8,730,235	1.70
India	8,078,843	1.59	8,000,000	1.55
Persia	6,856,063	1.35	7,200,000	1.40
Galicia	5,965,447	1.18	5,591,620	1.09
Peru	2,533,417	0.50	(c) 2,536,102	0.49
Japan and Formosa	2,898,654	0.57	2,449,069	0.48
Trinidad	1,599,455	0.32	2,079,068	0.40
Egypt	1,008,750	0.20	2,079,750	0.40
Argentina	1,144,737	0.23	1,321,315	0.26
Germany	995,764	0.20	711,260	0.14
Canada	205,332	0.04	304,741	0.06
Venezuela	127,743	0.03	190,080	0.04
Italy	50,334	0.01	35,953	
Cuba	19,167			
Totals	506,702,902	100.00	514,729,354	100.00

(a) Quantity marketed. (b) Estimated. (c) Estimated in part.

Oil Possibilities in Eastern New Mexico

In an article in the *Mining and Oil Bulletin*, Hager & Robitaille summarize their conclusions as to the possibilities of commercial oil development in eastern New Mexico as follows:

Unfavorable: (1) No large commercial oil or gas fields are in the immediate area. (2) There is uncertainty as to the depth and beds. (3) The area is in advance of development.

Favorable: (1) The stratigraphic conditions are favorable. (2) Commercial gas is found in similar beds near Amarillo, Tex. (3) Oil indications have been found, notably in the Brown and Belt wells, near Dayton. (4) The structural conditions are favorable for oil accumulation. (5) Transportation facilities are good.

Lincoln, De Baca, Chaves, and Eddy counties, N. M. are considered worthy of investigation as possible-oil-bearing areas. Four wells are to be drilled by the International Petroleum Corporation as a result of the information summarized above.

Rotary Rock Bits

Oil-Well Drilling by Rotary Methods Constitutes 23 Per Cent of All Drilling in This Field 22 Per Cent Being Done by Combination of Rotary and Percussion Processes.

BY ALBERT G. WOLF
Written exclusively for *The Journal*

TWO principal methods are used in drilling oil wells, the standard or percussion and the rotary. Each has its own field of usefulness, the standard method in the harder formations, and the rotary in the softer and caving formations, where its advantages far outweigh both its disadvantages and the advantages of the standard method combined. Seldom, if ever, is a well drilled to an oil-bearing sand through soft strata alone; generally, several strata and rock and well-packed sand must be penetrated. This condition caused considerable trouble in the early days of rotary drilling, for the bits then in use were adapted only to the softer strata, and much time and money were spent in drilling through the harder interstratified formations, or the cap rock of an oil sand.

Where the softer formations could first be drilled by the rotary method, and the hard cap rock penetrated by the cable-tool method, thus constituting what is known as the combination method, a solution of the difficulty was found. However, where the hard formations were comparatively thin and widely interstratified with the softer strata, and many changes from one method to the other had to be made, requiring that a considerable sum of money be tied up in machinery in order to do a comparatively small amount of drilling, the combination method would not pay. But to drill such a well by the rotary method alone necessitated the loss of considerable time, the waste of material used in unsuitable bits, and the incurring of unnecessary expense. The only solution of this problem was the devising of bits more suitable for piercing hard rock than the fish-tail bit,[1] which is well suited to drilling soft strata, but applicable only to such strata.

The invention and development of rotary rock bits lagged behind the introduction and successful application of the rotary method of drilling. The first authentic record of the rotary method states that it was used in Louisiana in 1888. Its development was rapid in all details, apparently, except in that of rock bits. As late as 1900, Captain Lucas spent over three months in drilling a well less than 1,000 ft. deep at Spindle Top. The reasons for this delay are not generally known, but it was probably due in part to the slowness with which the rotary fish-tail bit attacked the hard cap rock of that field, inasmuch as subsequent wells were completed by the combination method.

FISH-TAIL BIT NOT EFFECTIVE AGAINST HARD ROCK

The fish-tail bit, and all the earlier forms of rotary bits, had chisel edges and were so shaped that the cutting edge was applied to the rock surface in an almost vertical position. Against hard rock this arrangement was not at all effective, the cutting tool wearing away almost as fast as the rock itself. Finally, the application of the principle of the chipping effect of the emery dresser, used in dressing emery wheels, was recognized, and a bit employing this principle, with the superincumbent weight of the drill stem to give it crushing force added thereto, made an effective tool in any formation too hard for the chisel-shaped bit to cut rapidly.

So far as can be learned, the earliest successful form of rotary rock bit was the invention of Howard R. Hughes. Its manufacture started in a small way at Houston, Tex., in 1909, years after the successful application of the rotary method of drilling to soft strata. In 1912 the Reed roller bit made its appearance and was first used in Northern Louisiana. Both bits, though proving successful, naturally underwent a certain amount of alteration, and improvement, as experience in the field indicated. Both types are manufactured at Houston, Tex., and the industry is a steadily growing one.

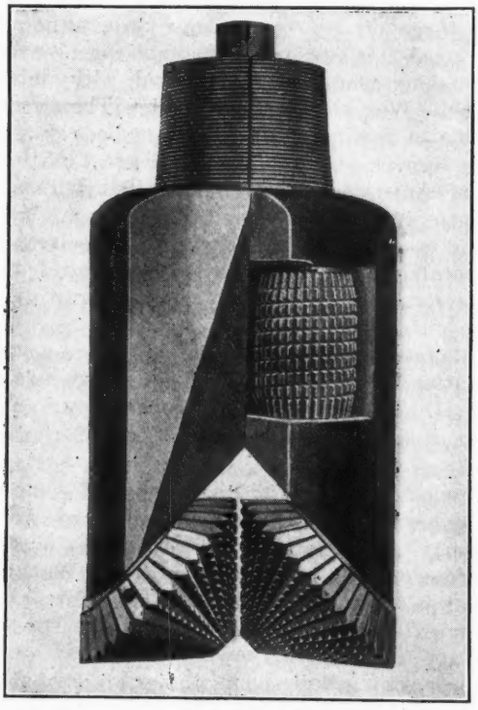


FIG. 1. HUGHES REAMING CONE BIT

HUGHES REAMING CONE BIT

The Hughes reaming cone bit, shown in Fig. 1, consists of a heavy steel body in two halves, held together by a through-bolt and lock-nut. At the lower end, on separate shafts, are two cones of hard steel, the faces of which are divided into sharp ridges that radiate from the apex, the ridges being notched to form rows of teeth. In the sides of the body part are set two cylindrical cutters of the same character

[1] "The Rotary Method of Well Drilling," *Eng. and Min. Journ.* Aug. 2, 1919.

as the cones, called the side rollers. Their function is to keep the hole reamed out to the full gage, because the edges of the cones wear and allow the hole to taper slightly. A liberal space for cuttings and water to pass up the hole and above the bit is provided by making each half of the body, opposite each side roller, flat, as shown. The top of the bit, as is the case with all the bits here described, terminates in a threaded shank, so that the bit can be screwed into a drill

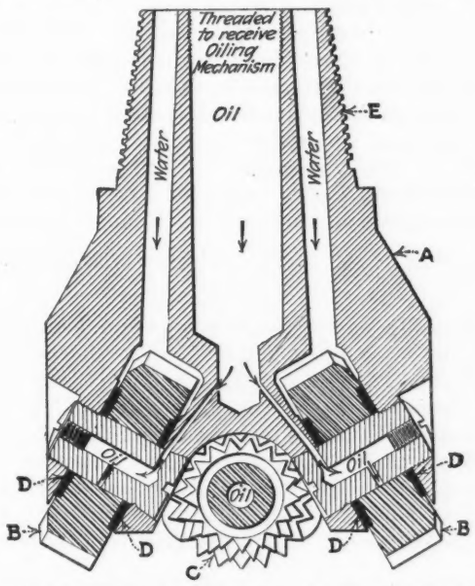


FIG. 2. CROSS-SECTION REED ROLLER BIT (CADDO TYPE)

collar or other tool. An older form of this type of bit had a shorter body and the two cutting cones, but no side rollers.

A special lubricating mechanism is provided and is screwed on to the smaller shank above the drill collar shank. This lubricator is placed inside the first joint of the drill stem and is so constructed that the pressure of the drilling water or mud on top of it forces the oil through the bit. An especially heavy oil is provided. This system of lubrication, in a general way, is used in all the rotary rock bits.

The cones are made of special alloy steel, quite soft and easy to work before tempering. They are shaped on special cone-cutting machines, heated in oil-fired furnaces, and tempered in oil baths. The cones can be re-dressed and used a second time if not too badly worn.

The cone bits are made in standard sizes ranging from 2⅜ in. to 18 in. in diameter. The following is a list of sizes, together with the maximum superimposed weights, recommended by the manufacturers, to be used for each. They are so gaged as to be ⅛ in. less in diameter than stock sizes of casing generally used in oil fields. Bits of any size can be had on special order.

STANDARD SIZES OF CONE BITS AND CORRFSPONDING DRILLING WEIGHTS

Size of Bit, In.	Maximum Drilling Weight Recommended, Lb.	Size of Bit, In.	Maximum Drilling Weight Recommended, Lb.
2⅜	2,870	6½	7,900
2¾	3,480	7⅛	8,650
3⅜	4,700	7⅜	9,270
4⅛	5,910	7⅞	9,560
4½	.....	8½	10,300
5⅛	6,670	9	11,000
5¾	7,140	9⅞	12,000

Larger sizes are 10½ in., 11, 11¾, 12, 12¾, 13¾, 14½, 15, 16, 16½, and 18 in.

This bit is adapted to the drilling of all formations too hard for the fish-tail form to penetrate successfully, but more especially to the hardest rocks found in oil-well drilling. For the hardest rock, less weight upon the bit and a greater speed of rotation give better results.

Reed Roller Bit and Reamer

The so-called "Caddo Type" roller bit of the Reed Roller Bit Co., of Houston, Tex., is another form of hard-rock bit. A vertical section of this bit is shown in Fig. 2, and a side elevation of the bit and reamer together in Fig. 3. The body or "drill head" (shown at *A*, Fig. 2) is made of steel in one piece. In the lower end of this drill head are fastened two "side cutters," *B-B*, or sharp-toothed wheels, and six "cross rollers," *C*. The cross rollers are in three sizes, the smallest two in the center, the largest on the outer sides. The diameters of these wheels are proportioned to the distance to be traveled in a revolution of the bit. The lateral thrust of the side cutters is against tempered tool-steel washers, *D-D*, which saves wear on the drill head.

Drilling water passes down through the center of the bit and out around the side cutters. Oil is fed to the bearings of all eight wheels from a lubricator within the drill stem. The shank of the drill head, *E*, is threaded to receive either the Reed reamer or a special drill collar, by which it is attached to the drill stem.

Reamer Can Be Used Separately or With the Roller Bit

The Reed reamer, Fig. 3, consists of a steel body in the sides of which are set four groups of cutters. Each group is made up of a beveled cutter at top and bottom, with a straight-sided cutter in the center. The cutters are corrugated wheels of hardened, special alloy steel. They run on hardened tool-steel shafts set in counterbored sockets open at the top only. The shafts

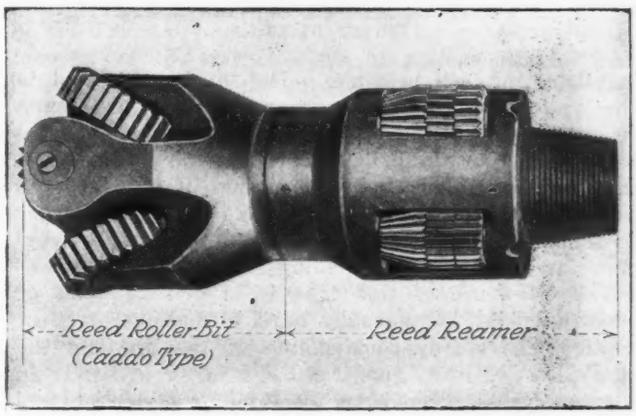


FIG. 3. REED ROLLER BIT AND REAMER

cannot revolve. Lubrication of the reaming cutters is provided for by the same system that feeds the bit with oil. The reamer can be used in connection with the roller bit, or separately to enlarge a hole already made. When used as a reamer only, an ordinary fish-tail bit, of the same diameter as the hole to be reamed, should be employed in advance of the reamer to act as a pilot. Both the roller bit and the reamer are made in standard sizes, and can be supplied in special sizes.

A bit similar in design to the Reed roller bit is the Hughes cross roller bit. The chief differences are that

in the Hughes bit the body or drill head is in two parts and there are only four cross rollers instead of six, as in the Reed bit. The side cutters are made symmetrical so that they can be reversed, when somewhat worn, to bring the bit out to gage. The chief objections to this bit are the rapidity with which the side cutters wear, thus drilling a tapered hole, and the wearing of the body part itself, which weakens the bit and makes it unsafe to use. This bit is recommended by the manufacturers for softer rock than that for which the reaming cone bit is recommended.

Pickin Gyratory Rock Drill

Fig. 4 shows a vertical section of a Pickin gyratory rock drill, manufactured by the Hughes Tool Co. This consists of a single horizontal cutter, circular in cross-section, and with many teeth on its bottom face; an eccentric body part; a screw cap, to hold the parts

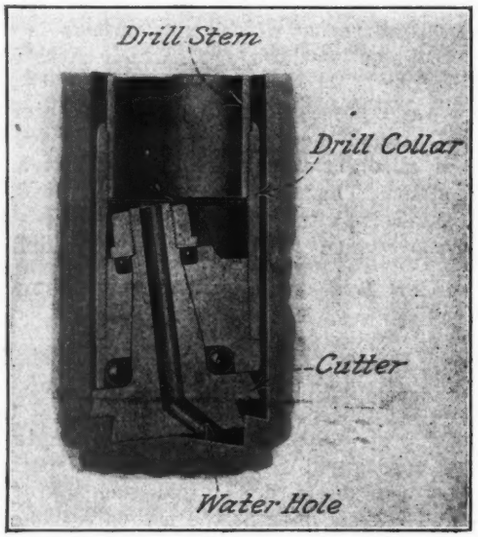


FIG. 4. VERTICAL SECTION OF PICKIN GYRATING ROCK DRILL

together, and ball bearings. The bit is connected to the drill stem by a drill collar. As the drill stem revolves, the peculiar circular rocking motion imparted to the cutter by the drill head causes the cutter to cut into the rock. This gyrating motion, if it may be so called, also causes the drill to bore a hole slightly larger in diameter than the bit itself, thus giving ample clearance for the up-flow of drilling water and cuttings.

The chief use of this type is in drilling holes of small diameter in unusually hard formations at great depth. The sturdy construction of the bit, and the single heavy cutter, give it a large factor of safety in supporting the tremendous weight of a string of drill stems in deep drilling.

Disk Bits Not Effective in Hard Rock or Sticky Formations

Various forms of disk bits have been placed on the market. They are not, strictly speaking, rock bits, but are intended for drilling in compact sand strata, dry crumbly shales, sandy clays, shell strata of the Gulf Coast country (formations made up of old shells with a binder of clay and sand), and the like. They are not effective in either hard rock or sticky formations, such as blue gumbo, for example. These bits will, however, penetrate thin strata of rock as well as the fish-tail bit, making it unnecessary to "come out" of the hole and change to a roller bit when rock is struck.

One form of the disk bit is shown in Fig. 5. It consists of a one-piece steel head, and two disks set on two shafts. The disks are inclined slightly from the vertical toward the central axis of the drill, and are not directly opposite each other, but slightly offset horizontally. They are removable, and various types, from the plain sharp disk to one with quite coarse teeth, can be used. Such a bit has been used in Wyoming and in other Western oil fields with success. It is claimed that this bit is capable of considerably greater footage than the fish-tail bit in dry or compact formations, for which it is intended, but not in cemented or sticky ground. In a test run in the Burkburnett field, Texas, under ideal conditions, the bit illustrated drilled at the rate of 36.6 ft. per hour.

Complete Data Necessary for Determining Best Results of Drilling

Reliable data on the performances of these various types of drills are difficult to obtain; furthermore, some of the information collected, though reliable enough, is too incomplete to be conclusive, formation drilled, size of hole, or depth of hole being unmentioned. The impossibility of determining the exact character of the rock drilled from the fine cuttings alone also tends to vitiate the value of all the drilling data. The following figures, however, will be sufficient to give anyone

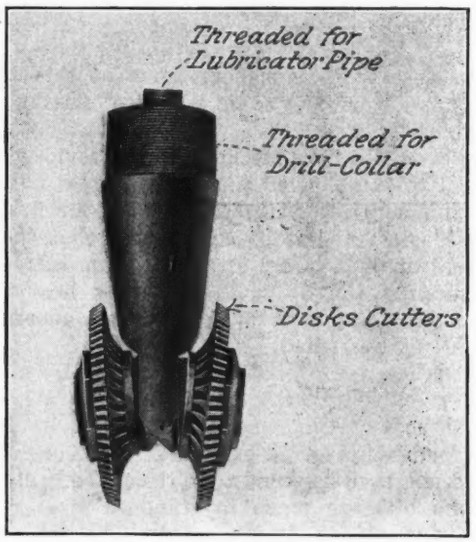


FIG. 5. HUGHES DISK BIT

not familiar with the use of these bits a fair idea of the results to be obtained:

RESULTS OBTAINED IN DRILLING WITH A 9¼-IN. HUGHES REAMING CONE BIT

Hours	Feet Drilled	Depth of Hole, Ft.	Formation
8.0	5.5	666.5 to 672	Tight clay shale
7.0	5.0	672.0 to 677	Tight clay shale
1.0	1.0	739.0 to 740	Tight clay shale
1.0	1.0	741.0 to 742	Tight clay shale
7.5	3.5	1148.5 to 1152	Sandstone
6.0	4.0	1152.0 to 1156	Sandstone
10.0	25.0 (a)	1182.0 to 1207	Sandstone
10.0	6.0	1207.0 to 1213	Sandstone

(a) This result obtained in reaming 5¾-in. hole to 9¼ in.

These results were not all obtained from one hole, but are merely grouped for convenience in comparison. The reaming result, as shown above, is good, although not fair to the drill, because the bit is not intended

solely as a reaming tool, the Hughes Tool Co. manufacturing a special tool for rock reaming only.

Test runs have also been made by these manufacturers to determine the speed of the reaming cone bit. In one test a 3⅞-in. hole was drilled through ten inches of hard granite in 5¼ min.; and in another, a 2⅞-in. hole was drilled in 10 min. through three inches of emery wheel. These holes, of course, are smaller than those generally drilled in practice, and the results only show the work of the drill in hard rock.

The length of life of the cones and side rollers is as varied as the kind of material drilled and the pressure to which they are subjected by the superimposed weight of drill stem. The care of the operators also has considerable effect on the life of the cones. The record life for any set of cones is 800 ft. of drilling in rock without resharpening. This is an exceptional record, the average life being nowhere near that figure, and sometimes not covering one foot of drilling, due to some particular conditions, without resharpening.

The following is a portion of a log of a well drilled at Bracken, Tex., with a Reed bit of the Caddo type:

LOG OF WELL DRILLED WITH ROLLER TYPE BIT

Hours	Feet Drilled	Depth of Hole, Ft.	Formation
12	2	13 to 15	Flint rock
12	6	15 to 21	Flint rock
15	4	21 to 25	Flint rock
15	14	25 to 39	Limestone
12	21	39 to 60	4 ft. rock, 17 ft. clay
16	22	60 to 82	Hard rock
16	24	82 to 106	Hard rock
24	16	106 to 122	Hard rock
24	3 (*a*)	122 to 125	Hard rock
12	7	137 to 144	Blue clay (fish-tail)
	9	144 to 153	Rock
18	17	153 to 170	Blue clay (fish-tail)
	3	170 to 173	Rock

(*a*) Together with 12 ft. blue clay drilled with fish-tail bit.

This record is remarkable in one respect. The rock drilling began at a depth of only thirteen feet below the surface, showing that in addition to the weight of the drill itself there was the weight of only one joint of drill stem to make the bit cut. It is reported also that only one set of cutters was used, and that they were in condition for further use.

Rock bits have played an important part in the development of the world's oil resources. Without them, the rotary method would never have done more than a small proportion of the total drilling, and would not have been brought to its present state of efficiency. The importance of this may be better understood when the relative percentages of the methods used in drilling wells are shown. The standard method is used in 55 per cent, the rotary method alone in 23 and the combination in 22 per cent of the drilling of the world's oil wells. Of the 23 per cent drilled by the rotary method alone, it is safe to say that only a small number, relatively, is completed without the use of a rotary rock bit of some form. In addition to the oil wells, a great number of deep-water wells and all the sulphur wells of the three producing sulphur companies of Louisiana and Texas are drilled by the rotary method. It is thus apparent that the rotary rock bit is not a passing fancy nor a fad, but a tool of great importance.

Petroleum vs. Coal

THE effect of the coal strike is reflected in the decrease in petroleum stocks which occurred during October and November of last year. Receipts of crude petroleum from the wells of Kansas and Oklahoma increased, in October and November, about 715,000 bbl., compared with September, and yet the oil held in storage on Nov. 30 amounted to only 62,258,000 bbl., compared with about 65,000,000 bbl. on Sept. 30.

With the scarcity and consequent increase in the price of coal, many companies are turning to fuel oil, which has not had a proportional advance; particularly as no extensive combustion equipment is necessary for the change. A case in point is the reverberatory plant of the Hayden, Ariz., smelter of the American Smelting & Refining Co. Although this company did have more or less trouble from its recently installed pulverized-coal equipment, the reason that it has resumed oil firing is because of the comparatively lower price of the liquid fuel.

An interesting fact in this connection is that the petroleum marketed in the United States, large in amount though it is, supplies only 11 per cent of the heat units furnished by our domestic coal.

Standard Oil Reported To Have Acquired Oil Properties in Colombia

It is believed in the financial district that the Standard Oil Co. of New Jersey, through the International Petroleum Co. of Canada, has acquired the properties of the Tropical Oil Co. in Colombia. According to the story, which appeared in the New York *Journal of Commerce*, the sale involves the De Mares concession of 2,000,000 acres, for a reported price of $40,000,000.

This transaction, according to this paper, indicates the Standard Oil interests intend to carry out an extensive development campaign in South America, particularly in Colombia, where oil is believed to exist in enormous quantities. The Tropical Oil Co. is a Benedum-Trees development. Three wells have been completed on the eastern side of the Magdalena Valley, and from geographical indications on other areas of the concession it is evident that a field of great promise has been discovered.

Adjacent to the Tropical concession is another Benedum-Trees property, an area of 1,500,000 acres, owned by the Transcontinental Oil Co. This property has a frontage of 100 miles on the Magdalena River. Six drilling crews are now in the field, where there are large live seepages of oil. Some of the crude is exceptionally high quality, being 55 Bé.

Oil Possibilities in Scotland

In the transactions of the Mining Institute of Scotland, Vol. 41, Part 3, H. M. Cadell gives a most able résumé of all the evidence known to Scottish geologists at the present time regarding the probable presence of oil in the oil-shale fields to the east and west of Edinburgh. "Summing up the whole matter," Mr. Cadell says, "it would appear that the evidence is all against liquid oil being found in the oil-shale fields or carboniferous districts of the Lothians and Fife. As to other places in Scotland, the evidence for oil is probably not any better. Thousands of deep bores have been made during many years in search of coal, oil-shale, iron-stone, and water, and if there had been any indications of oil or oil-gas in these boreholes, it would doubtless have become public property long ago."

Mr. Cadell calls attention to the peat-bogs as a source of oil. These might be excavated and the peat distilled for oil and other important byproducts. A particularly large amount of ammonium compounds could be secured by this means.

NEW PUBLICATIONS

First Annual Report of the Secretary of the State Bureau of Mines and Geology, for the period April 20 to Dec. 31, 1919. By the University of Idaho, Moscow, Idaho, 1920.

Abstracts of Current Decisions on Mines and Mining, Reported from September to December, 1918. By J. W. Thompson. Paper, 6 x 9; pp. 166. Bulletin 179, U. S. Bureau of Mines, Washington, D. C., 1919.

Abstracts of Current Decisions on Mines and Mining, Reported from January to May, 1919. By J. W. Thompson. Paper, 6 x 9; pp. 175. Bulletin, 181, Bureau of Mines, Washington, D. C., 1919.

Annual Report on the Mineral Production of Canada, during the Calendar Year 1917. Paper, 6½ x 9¾; pp. 258. Department of Mines, Ottawa, Canada, 1919.

Los Temblores de Guadalajara en 1912. By Paul Waitz and Fernando Urbina. Paper, 8 x 11½; pp. 85, illus. Bulletin 19, Instituto Geologico de Mexico, Departamento de Exploraciones y Estudios Geologicos, Mexico, D. F., 1919.

Labor Laws of the State of California, 1919. Prepared by the California State Library. Paper, 4½ x 6½; pp. 261. Bureau of Labor Statistics, State of California, San Francisco, Cal., 1919.

California Mineral Production for 1918, with County Maps. By Walter W. Bradley. Paper, 6 x 9; pp. 212, illus. Bulletin No. 86, California State Mining Bureau, San Francisco, Cal., 1919.

This excellent compendium follows the style of former publications of the same kind. It gives in compact form the mineral production of the state as well as the production from individual counties. The statistical information is complete and well arranged, and reflects credit upon its compiler.

Heaton's Annual for 1920. Published by Heaton's Agency, Toronto, Ont. Cloth; 5 x 7½; pp. 550.

This reference book, now in its sixteenth year, should be in the hands of every one who is called upon for information about Canada. Its most valuable section, without doubt, is that devoted to the Canadian Customs Tariff, as it gives the rate of duty for all materials. This section alone takes up about 130 pages. A large part of the book is devoted to a description of the natural resources and commercial opportunities of the various parts of the country. This section is arranged by cities and towns, giving hotels, railways, and other data of great convenience to the traveler. The book, I believe, is unlike any volume published in the United States; it has more descriptive matter and less of a statistical nature than the "World Almanac," for instance. E. H. R.

Industrial Mexico; 1919 Facts and Figures. By P. Harvey Middleton. Dodd, Mead & Co., New York, 1919.

This book on Mexico is an industrious compilation of the superficial sort, with very little of the flavor that springs from actual knowledge, study, or experience. The author made the railway trip from Laredo to Mexico City and thence to Vera Cruz, in April and May, 1919. He has compiled a great deal of data concerning Mexico, which may be accepted with caution, especially his comments and conclusions; as, for example, when in commenting on the reported discovery by a Mexican government engineer of important deposits of petroleum on the Gulf of California, he observes that "these new discoveries are on the same parallel of latitude with the deposits on the coast of the Gulf of Mexico, and indicate the presence of oil right across the republic." We are also interested, but are not committed, as to his "natural geyser of petroleum" on the coast of the Gulf of California and as to the exploitation of the petroleum deposits beneath the Gulf of Mexico, concerning which it is claimed that "the exploitation of submarine oil is cheaper than sinking of wells on land." Also, the statement (p. 68) that selenium is found in four states in Mexico leaves us cold. It is essentially newspaper reporter type of work; nevertheless it indicates a great ability to collect and collate data. J. E. S.

The World Almanac and Encyclopedia. Published by the Press Publishing Co., Pulitzer Building, New York City. Paper; 5 x 7½; pp. 944.

This book probably contains more up-to-date statistical information on subjects discussed in ordinary conversation than any other volume extant. There is hardly a subject outside of those of purely technical interest to which reference is not made. Furthermore, the information is timely, events up to Dec. 17, 1919, being included.

Although well known to practically all of our American subscribers, there may be some living in foreign countries who have not yet run across the World Almanac. Much information of general interest is provided, and it is difficult to see how any one would not derive half a dollar's worth of benefit from having this reference book on his shelves. E. H. R.

The Mineral Industry During 1918. Edited by G. A. Roush and Allison Butts. Cloth, 6 x 9; pp. 937. McGraw-Hill Book Co., New York, 1919.

Little that is new can be said about *Mineral Industry,* the twenty-seventh volume of which has now been published. It is the book to which one instinctively turns if he wants a résumé of what was published on lead-smelting practice during the year; if he wants to know the status of the copper industry in Cuba; if the gold production in Canada in 1912 is in dispute; or if information on new uses for mica is desired. Separate chapters are devoted to the various minerals, each being written by an expert on the subject under discussion. Most of the authors have not, however, contributed much original matter but rather have compiled the most interesting published information of the year, which they present in connected form, featuring, especially, statistical data and the economic aspects of the minerals covered. Almost every one who mines, smelts, sells or deals in any way with mineral products will find these yearly books a time-saving addition to his reference library. E. H. R.

The Petroleum Handbook. By F. O. Andros. Limp cover, 4¼ x 7; pp. 206; 48 illustrations; 17 tables; Shaw Publishing Co., Chicago, Ill. 1919.

This book contains little original matter, being largely a compilation of U. S. Government reports and other publications devoted to the individual subjects which it covers. Nowadays, many men are becoming interested in oil, largely, perhaps, through stock ownership in some of the new companies which have recently been floated. To such and to those who have had no previous knowledge of the petroleum industry this pamphlet should be useful.

Chapter 1 discusses the origin, accumulation and occurrence of petroleum; Chapter 2, exploration and drilling; Chapter 3, methods of petroleum refining; and Chapter 4, natural gas and its products. There is also a short chapter devoted to the shale-oil industry, in which the Scottish practise is described. The remainder of the book is devoted to the marketing of petroleum products, to their economic utilization, and to spcifications and inspection laws. The book as a whole, as already intimated, will be more valuable to the comparatively inexperienced, who may wish general information on the petroleum industry, than to experienced oil men. A defect of the book which is almost fatal in a hand book is that it has no index. No index is better than a poor one, but this is something which should be remedied if future editions are published. E. H. R.

The Mica Miner's and Prospector's Guide. By A. A. C. Dickson. 4¾ x 7¼; pp. 50; 12 figures. E. & L. N. Spon, Ltd., London, and Spon & Chamberlain, New York, 1919.

This book is designed particularly to assist mica miners and prospectors. It comprises descriptions of eight mica

mines in India, followed by a discussion of methods and machinery used, notes on the geological occurrence and classes of mica, concluding advice, and a glossary of the local terms used. The mica in the Kadarma district described, occurs chiefly in series of lenses in pegmatite veins, and the author concludes that the most economical mining method is to follow the productive lenses without attempting to work the entire width of the pegmatites.

The most important feature of the text is the author's claim that, through years of careful observation, he is enabled to trace a pinched-out mica-bearing lens to the next lens by means of certain "indicators"; that he can thereby direct mining operations in the most economical way, and thus avoid a large share of the blind and wasteful search for mica pockets so commonly followed in India.

The author's claim that mica is usually confined to shoots consisting of connecting lenses, and that his methods are, therefore, generally applicable, is not supported by the facts. According to published descriptions of American deposits, mica is commonly distributed uniformly throughout the pegmatite, it may be segregated in fairly uniform bands near the walls, or it may occur in pockets or lenses which may or may not be connected.

Reference is made to the published work of five geologists, describing mica deposits in Canada, the United States, India, and Norway, no footnote reference to the publications quoted being given except in one instance. The geologists are taken to task for not observing with sufficient care, and for not interpreting their observations in accordance with the author's ideas. Though the author's interpretations of the Kadarma deposits may be correct, there is danger of introducing grave errors and injustices when one investigator attempts to superimpose his interpretations on descriptions of deposits in other parts of the world where the conditions probably are quite different from those observed in his own locality.

Though the mining method recommended follows, in general, the native method of developing the productive shoots from lens to lens, it has the advantage of more scientific methods of tracing the shoots. Furthermore, by systematic expansion of the workings, and by the introduction of machinery and projection of shafts, the deposits can be worked economically at much greater depths than by native methods. It would appear, however, that the present methods might be supplemented, in the case of wide pegmatite veins, with a systematic development of crosscuts, in order to discover "blind" pockets. O. B.

The Strategy of Minerals. By George Otis Smith, with an introduction by Franklin K. Lane. Cloth, 5 x 8; pp. 372, illus. D. Appleton & Co., New York, 1919.

No thorough understanding of the causes that begot the Great War is possible without familiarity with the facts so comprehensively set forth in "The Strategy of Minerals," a collection of records and essays written for the most part by the specialists of the U. S. Geological Survey, and issued by the Director of the Survey, George Otis Smith. Nor will any history of the recent conflict be complete unless it include the statement of the mineral resources of the contending nations, the possession of which, with the tremendous commercial advantages that such possession assures, served as a stimulus to Teutonic greed and purpose to seize the political and industrial domination of the world. While we await the completion of the labors of the military historians, there is much gratification in finding at hand so satisfying a groundwork for the final record.

Mr. Smith's book is in a double sense of social, industrial, and economic value in that it also points with force, logic and truth to the duties of this most difficult of readjustment periods, and enunciates a strategy of peace requiring in no degree less skill in generalship, patriotic inspiration, and masterly execution than were demanded in the last great thrust to victory. In it some of the generals who served at home—and who served well—modestly make their report to the people of America.

The title suggests only in part the scope and purpose of the work. It was patently intended to connote the great facts of the evolution of the race and to make plain both their significance and their promise. No five-foot post-war shelf is complete without it. The work is of the very stuff that in this period of loose writing and looser talking is sorely needed as a corrective and a guide.

So much in the volume is worth quoting that selections would be unsatisfactory and discriminatory. The introduction by Franklin K. Lane, the chapter on "The Position of the United States," by Joseph B. Umpleby, and Mr. Smith's own chapter, "A Look Ahead," are notably effective examples of keen and analytical judgment and fine purpose.

Co-operating with Mr. Smith in the compilation of the volume were Messrs. C. E. Lesher, William D. Heroy, A. C. Spencer, S. B. Butler, C. E. Siebenthal, Edson S. Bastin, Stephen R. Capps, G. F. Loughlin and Joseph B. Umpleby, of the U. S. Geological Survey; Lester H. Woolsey, Soliciter of the Department of State; and J. E. Spurr and Frank F. Grout, of the U. S. Shipping Board.

An appendix supplies a reprint of the Food and Fuel Control Act and the Mineral Control Act; and a very complete index facilitates easy reference to the subjects treated in the thirteen chapters and to recent production, exports, and imports of minerals.

Adequate and skillful editorial preparation by Francis G. Wickware compels recognition at a time when it is the practice of many publishers to slight literary technique.

That all authors' royalties on the sales of the book are devoted to the American Red Cross fittingly demonstrates the spirit that produced it and sent it forth.

W. N. P. R.

Other Recent Publications

Ore Washers—A new type of ore-washing machine has been developed at the experiment station of the Minnesota School of Mines for use in treating low-grade iron ores. Most of the plants now employ log washers. The new machine consists of a simplex Dorr classifier, in the rear end of which is mounted a revolving trommel, the lower one-fourth of which is submerged in the water in the tank of the classifier. In the lower end of the trommel is mounted a discharge scoop, which removes the material from the inside of the trommel and discharges it over the tailboard of the classifier in a comparatively dry condition. The speed of revolution is sufficient to cause great agitation of the material, the ore being carried up on the side of the revolving trommel, from which it cascades back into the water. This cycle is repeated over and over until the lumps of ore reach the lower end, where they are discharged by the feed scoop.

The material which passes through the openings in the trommel settles into the classifying compartment of the machine. The heavier particles settle to the bottom and are raked out and delivered as a comparatively dry concentrate, the lighter particles overflowing with the excess of water as tailing. A plant equipped with these machines would almost certainly cost less, would possibly use less water, would use very much less power, and would be more economical of steel than the standard washing plants. Test data and descriptions of possible flow sheets are included in the discussion. The pamphlet may be obtained free of charge by requesting Bulletin No. 6 of the Minnesota School of Mines Experiment Station, Minneapolis, Minn.

Natural Resources of the Caucasus. A recent supplement to Commerce Reports devotes fifty-five pages to a description of that part of Russia known as the Caucasus. Of particural interest to *Journal* readers are those portions devoted to the Kuban, Grozny, Gurya, and Baku oil fields, occupying eight pages; to the manganese industry, four pages; to the copper resources of the country, nine pages; and to various other minerals, including silver, lead, zinc, cobalt, nickel, antimony, pumice stone, asbestos, and asphalt, five pages. The pamphlet is compiled from Russian, English, and American sources. Those interested in that part of the country should apply to the U. S. Department of Commerce, Washington, D. C., for Supplement to Commerce Reports, No. 13a, Nov. 3, 1919, for which no charge is made.

ECHOES FROM THE FRATERNITY

A. I. M. E. Meeting in New York Feb. 16 to 19 Inclusive

Sessions on Petroleum of Special Interest—Committees Planning for a Record Attendance

The annual meeting of the members of the American Institute of Mining and Metallurgical Engineers will be held in New York City Feb. 16 to 19 inclusive, at the headquarters of the Institute, Engineering Societies Building, 29 West 39th St. The committee on arrangements, of which E. P. Mathewson is chairman, has prepared a specially interesting program for this year's session. Four sessions on petroleum will be held, and the technical papers on oil and general mining and metallurgical subjects are of traditional importance and excellence. The committee asks that efforts be made to increase the membership of the Institute, and suggests that the present meeting provides a specially appropriate occasion for adding thereto.

The Institute of Metals Division will make its headquarters at the Hotel Seville, Madison Ave. and 29th St.

A varied program has been arranged for the entertainment of the ladies attending the meeting. A summary of the program of the New York meeting follows:

Monday, Feb. 16

9.00 a.m. to 5.00 p.m—Registration at Institute Headquarters.
11.00 a.m.—Oil Session.
12.30 p.m.—Luncheon at Headquarters, Fifth Floor.
2.00 p.m.—Simultaneous Sessions on Oil.

Tuesday, Feb. 17

9.30 a.m.—Annual Business Meeting, A. I. M. E.
11.00 a.m.—Simultaneous Sessions on Mine Taxation
Oil.
Non-Ferrous Metallurgy.
12.30 p.m.—Luncheon at Headquarters, Fifth Floor.
2.00 p.m—Simultaneous Sessions on Bituminous Coal Industry.
Milling and Smelting.
Oil.
Coal.

Wednesday, Feb. 18

10.00 a.m.—Simultaneous Sessions on Geology and Mining.
Iron and Steel.
12.30 p.m.—Luncheon, Institute Headquarters.
2.00 p.m.—Simultaneous sessions on Alloy Steels.
Iron and Steel.
Reports of Sub-Committees of Committee on Industrial Organization.

Thursday, Feb. 19.

Excursion to Bush Terminal, Brooklyn, by Sight-Seeing Automobiles from Institute Headquarters.

The annual banquet will be held on the evening of Tuesday, Feb. 17. The charge will be $5 a cover. Reservations may be made through Donald M. Leddell, to whose order checks should be drawn.

For the entertainment of the ladies a large and representative committee has been appointed, of which Mrs. Arthur S. Dwight is chairman.

Reservations for hotel accommodations may be made by telegraph to Wilbur Judson, 14 Wall St., New York.

Herbert Hoover

Engineer and Administrator Now—Why Not President, Ask San Francisco Engineers

The Joint Council of Engineers of San Francisco, stirred by the present strong and widespread sentiment for Hoover as an independent, non-partisan, and unpledged candidate for President, and convinced by the demonstration of superlative executive and administrative ability Hoover displayed in the war problems he solved so successfully, feels that it has a patriotic duty to perform at this time, not only as representing engineers, but also as a representative body of American citizens. It therefore adopted unanimously on Jan. 13, 1920, the following:

"Resolved, that the Joint Council of Engineers of San Francisco, representing 2,000 engineers in the Bay district, indorses Herbert C. Hoover for President and invites the engineering bodies of the United States to join with it in forming an organization to further Mr. Hoover's election, and in such other activities as will insure the affairs of the Nation being handled on an efficiency and non-partisan basis, and

"Resolved, that copies of this resolution be sent to all engineering organizations and technical journals throughout the United States, and that such other steps be taken as will further the movement of Hoover for President."

The Journal is proud to be able to claim that it was one of the first engineering journals to urge Hoover for our next president, as was done in our issues for Sept. 27 and Jan. 31. In Hoover we should certainly have a President of proved administrative ability, of unquestioned integrity, free from partisan politics, and singularly versed in the cure for the evils attending our reconstruction years now at hand.

Up with the engineers—Hoover for President!

Geological Society of America Announces Program

No Discrimination Against Working Geologists—Officers Elected for 1920

The circular of the Geological Society of America dated New York, Jan. 20, and sent out by the secretary, advises that the Council has adopted the following minute concerning the eligibility of geological engineers or economic geologists to membership in the society:

"Whereas, questions have been raised concerning the standards of eligibility for fellowship in the Geological Society of America, be it

"Resolved, that it is the sense of the Council that the society should carefully adhere to uniform standards of eligibility. The constitution states that 'Fellows shall be persons who are engaged in geologic work or in the teaching of geology,' and that 'The object of this society shall be promotion of the science of geology in America.' The Council believes that there should be no discrimination against a man engaged in commercial geology, but, instead, if he shows scientific spirit and constructive ability—if he contributes and will presumably continue to contribute toward the advance of the science—he is eligible for fellowship. In accordance with present aims and the established policy, the attempt should be made to discriminate solely on the basis of scientific fruitfulness—or contribution to geology. The skillful application of geology to economic ends, and the mere assembling and presentation of facts with suggestions as to their meaning, are not regarded as important contributions to the science, and this applies to men engaged in all branches of geology. The society desires men who build rather than those who accumulate building material."

The Council has made the following nominations of officers for 1921: President, James F. Kemp; first vice-president, J. B Woodworth; second vice-president, Arthur Keith; third vice-president, T. W. Stanton; secretary, Edmund Otis Hovey; treasurer, Edward B. Mathews; editor, Joseph Stanley Brown; councilors, 1921-1923, J. E. Spurr and G. D. Louderback.

The next meeting of the society will be on Dec. 28-30, 1920, at the University of Chicago, in affiliation with the American Association for the Advancement of Science.

Technical Employment Service

Frequent requests for assistance in securing technical positions, as well as in filling such vacancies, have inspired Fletcher Hamilton, State Mineralogist of California, to organize in his office a system for recording such vacancies.

National Society of Engineers Proposed

A joint conference committee composed of representatives of the four great engineering societies has recommended the formation of a single comprehensive organization, the purpose of which would be "to further the public welfare wherever technical knowledge and training are involved, and to consider all matters of common concern to these professions."

The plan of organization is to form a large number of local societies, the membership in which would be open to all citizens having a legitimate interest in engineering, and to form from these local bodies a national organization of federation. The plan has the approval of the governing boards of the Four Founders Societies. The committee having the matter in charge will report to the Institute of Mining and Metallurgical Engineers at the annual meeting in New York, on Feb. 16 to 19.

There is already in process of formation an engineering society the organizers of which aim to make it national in this scope—the American Society of Engineers. It is the belief of the representatives of the Four Founders Societies that the best interests of the profession and the various industries which it serves would be promoted by an affiliation in the proposed new organization of all local and national societies having a common object and purpose.

Pyrite Deposits in Michipicoten District Surveyed

A report by W. H. Collins on "The Ore Deposits of Goudreau and Magpie-Hawk Areas, Michipicoten District, Ont." is included in the Summary Report of the Canadian Geological Survey for 1918. Part E is of special interest because of the large pyrite deposits that it maps and describes. Two such areas, each about twenty-five miles square, one near Goudreau and the other on the Algoma Central Railway, between Magpie and Hawk junctions, have received special attention; but important deposits also occur outside these limits.

The pyrite, with siderite and hematite, is of the Keewatin iron formation, which is composed essentially of banded silica, pyrite, and sideritic limestone, all closely folded and now broken into discontinuous belts. The bands follow each other downward in the order named, if simultaneously present. The pyrite is usually richest under the banded silica and leaner with depth.

The principal properties include those of the Nichols Chemical Co., New York, northeast of Goudreau station; Rand Consolidated, leasing locations at Goudreau and west of milepost 176; and the Algoma Steel Corporation, which owns 437 acres just north of Goudreau Lake, and has explored near milepost 25 on Michipicoten branch as well as the iron range near Parks Lake.

COURT DECISIONS IN MINING CASES

Beatty-Guggenheim Lawsuit

Story of the Controversy—Principles of Law Involved—Rights and Duties of Engineers

BY WELLINGTON GUSTIN
Written exclusively for *The Journal*

Difficulties arising between principal and his agents, in the fascinating game of mining exploitation, are revealed in the recent case of Alfred Chester Beatty against the Guggenheim Exploration Co. and Oscar B. Perry. The case was three times before the Court of Appeals of New York, and has been in the courts for some time. (122 N. E. 379.)

Justice Cuddeback recited the facts out of which the difficulties arose. One Treadgold owned mining property on Bonanza Creek, in the Yukon mining district of Alaska, and sought to sell the same to the defendant Guggenheim company, giving the company an option thereon in May, 1905. In June, 1905, John Hays Hammond, who was manager of the Guggenheim company, directed Mr. Perry, a mining engineer in the employ of the company, to investigate Treadgold's offer. Perry went to the Yukon district, examined the property, and advised the company to take it over. Mr. Hammond then directed the plaintiff, Beatty, to go to the Yukon and further investigate Treadogld's propositions and schemes.

After his investigations of the Yukon properties, Mr. Beatty advised the Guggenheim company by telegraph to purchase the Treadgold interests. Mr. Hammond replied on Sept. 2, 1905, that the price was too high.

Now, after the Hammond telegram of Sept. 2, Perry arranged a plan to get from Treadgold certain mining claims lower down on Bonanza Creek, known as claims 89—104 below discovery, and work them as a mine. These claims were not included in the Treadgold offer to the Guggenheim company. As Perry did not have the money to purchase these claims, he invited Beatty to take a share in the enterprise. To get these claims it was necessary to have $45,000 at once, about $115,000 May 1, 1906, and later $150,000 for equipment. Beatty agreed to advance Perry $20,000 on the immediate requirement, and he further agreed to advance 35-45ths of the future payments, and it was agreed that Beatty should receive 35-45ths of the profits accruing from the venture, and should be repaid for all the moneys advanced to Perry.

Mr. Hammond, the company's general manager, was given a copy of the Perry-Treadgold contract, and Mr. Beatty also informed him of the arrangement he had made with Perry for a joint interest with Perry in the contract, but he did not inform Hammond of the amount of his interest.

Therefore the Court of Appeals modified judgment and awarded plaintiff his "share of profits under the so-called Perry-Treadgold contract, to wit, $27,300 in cash with interest from April 1, 1908, and 5,460 shares of the capital stock of the Yukon Gold Co. of the par value of $27,300, with any dividends declared thereon since April 1, 1908."

Pioneer Reduction Co. Denied Specific Enforcement

No Parol Agreement Proven — Bad Faith a Bar to Equitable Relief

In the case of the Pioneer Reduction Co. of Nevada City, against F. C. Beedle and the Belleville Tailings Association of Belleville, Nev., the U. S. Circuit Court of Appeals, in affirming the decree of the District Court for Nevada in favor of defendants, held that under the evidence there was no parol agreement between the parties, as alleged, to share jointly in an enterprise with such certainty as to warrant specific enforcement. It was further held that, if such parol agreement were made, the complainant was chargeable with bad faith in acting under the agreement, which barred it from equitable relief.

The controversy arose over a dump of tailings from the Candelaria mines at Belleville, Nevada, which amounted to about 150,000 tons, one-fifth of which was said to be owned by the Rhodes Mining Co. of San Francisco, Cal., and four-fifths by the Argentina Mining Co. of Nevada. The complainant corporation and defendant Beedle both desired to acquire these tailings to work for profit, assays showing about one dollar in gold and about 8 oz. in silver. Complainant alleged an oral understanding with defendant to use their joint efforts to secure the tailings, and if secured to work them jointly—sharing equally in the expenses and in all profits arising from their treatment and reduction, and that it reached an agreement with the owners by which the complainant was to have the right to work the tailings on a royalty basis of 45c. a ton, which agreement was reduced to writing but never executed, due to the fact that defendant secured an agreement for the tailings on a royalty basis of 50c. per ton.

Beedle subsequently refused to comply with the terms of the alleged joint adventure contract. The complainant further alleged that defendants had already treated at least 50,000 tons of the tailings, extracting therefrom metals of the value of $150,000, from which there had been realized a profit of $50,000 or more.

The defendants' answer denied,

among other things, the alleged contract of joint adventure, the negotiations for the tailings by and in the name of the complainant, and claimed that complainant had never reached any agreement with the owners of the tailings for the working or treatment of them, or that Beedle's contract with the owners was made clandestinely or in fraud of the complainant.

In going over the evidence in the case the court said:

"It is evident, we think, that neither Hall (representing the Pioneer Reduction Co.) nor Beedle then considered that there was any definite agreement between them, but, if so, that each was acting in bad faith toward the other, in which latter event neither has any standing in a court of equity."

Concluding its opinion, the court said that it was not even contended that the evidence showed there was anything specific or definite in respect to the alleged parole agreement, and that in such a case it is essential that the evidence be clear and satisfactory, both as to the existence of the contract sought to be enforced, as well as to its terms. Accordingly, the denial of the decree of specific performance of the alleged contract in the lower court was upheld.

Judgment Against South Utah M. & S. Reversed

Contract Held to Admit of No Implication—Supply of Water Limited by Express Terms

A decree in favor of the Utah Leasing Co. and against the South Utah Mines & Smelters has been reversed by the U. S. Circuit Court of Appeals for the Eighth Circuit. The Utah Mines & Smelters, defendant in the suit, in 1914, and for some years prior thereto, was operating a copper mine and ore concentrator on its properties in southern Utah, the crude ore being concentrated by use of a large volume of water owned and brought by it a distance of about nine miles through a large steel pipe, this pipe having a capacity of 800 gal. per min. Tailings from the company's huge dump were leased to the Utah Leasing Co., which erected a mill near that of the defendant.

The contract between the parties provided for the use of water from defendant's pipe. Defendant shut down its plant shortly after the contract became operative, but continued to permit the use of water by the complainant leasing company for its mill. Subsequently disputes arose between the parties as to the amount of water so used by the leasing company. The smelters company claimed that the leasing company was limited to 200 gal. of water per min., and that it was using far more and should pay for the excess. The leasing company claimed the contract gave it the right to use as much as was reasonably necessary for the operation of its plant. The smelters company threatened to cut off or limit the water supply, and the leasing company asked for an injunction preventing it from interfering with such supply of water as it reasonably needed for operation, amounting to about 600 gal. per min. The trial court granted such injunction.

The contract is in writing, and the Court of Appeals found it to express an intention to limit the maximum water supply to the Utah Leasing Co. to 200 gal. per min., instead of permitting the use of all reasonably necessary to the plant's operation.

As against the plain terms of the contract the leasing company sought to avoid its language by saying the contract did not purport to deal with the circumstances of the shutting down of the mine and mill of the smelters company. The court said, "It then asks this court to supply that deficiency by an implication that the parties had in mind at the time the contract was made, and intended as a part thereof, that if the appellant closed down its mill it should permit the (leasing company) to use all the fresh water it might need beyond 200 gallons."

Further, it said a court could not by implication add to or change a contract which is clear and complete, and a clause provided that, should the smelters mill close down, the leasing company should care for the pipe line, showing this very contingency was in the minds of the parties. Therefore it held the reasonable view is that the parties intended to and did define that quantity of water to be used in express terms.

Decision on Oil and Gas Lease

Provision in Oklahoma Case Construed —Lessee To Pay Rent or Complete Well in One Year

The Supreme Court of Oklahoma has reversed the lower court in giving judgment to Hauser and wife against one Garber and others cancelling an oil and gas lease on 160 acres of land in Garfield County, Okla. The oil and gas lease was dated Jan. 4, 1916, and is what is commonly referred to as "Producer's Form 88." It was to run five years and contained the provision, "If no well be completed on said land on or before the fourth day of January, 1917, this lease shall terminate as to both parties, unless the lessee on or before that date shall pay or tender to the lessor $160, which shall operate as a rental and cover the privilege of deferring the completion of a well in twelve months."

The Supreme Court construed this to give the lessee the option either to pay the rental or complete a well prior to Jan. 4, 1917, and that the beginning of a well prior to Jan. 4, 1917, was not a condition precedent; but the payment or tender of the rentals prior to Jan. 4, 1917, would extend the lease for one year.

Sixteen to One Claim Affirmed

Circuit Court of Appeals Sustains Judgment in Favor of Original Claim

The United States Circuit Court of Appeals has affirmed the decree of the District Court for the Northern District of California to quiet title in favor of the Original Sixteen to One Mine, Inc., and against the Twenty-One Mining Co. and the Valentine Mines Co. The plaintiff owns the Sixteen to One mining claim, and the defendant Twenty-One Mining Co. owns the Valentine and the Belmont Quartz Lode Mining claims adjoining, located in Sierra County, Cal. The subject of the controversy was a vein carrying gold and other valuable minerals, the apex of which, from the complaint filed, is wholly included within the lines of the Sixteen to One claim, but which on its downward course extends beneath the surface of the claims owned by the defendant.

The real controversy on the merits of the case, said the court, is as to the identity of the vein found beneath defendant's claims with the one having its apex on the claim belonging to the plaintiff. The latter vein terminates at fault. On the other side of the fault, and a short distance below, another vein exists. Plaintiff's contention was that these veins on either side of the fault are in fact segments of the same vein.

Defendants claim that they are entirely different veins; that there were originally two veins, one lying above the other, of which the disputed vein was the upper, and plaintiff's vein the lower; that a portion of plaintiff's vein was thrown upward several hundred feet, so as to bring it a short distance above the vein in dispute on the opposite side of the fault, and the same disturbance also threw the continuation of the disputed vein lying on that side of the fault several hundred feet upward; that therefore the real continuance of plaintiff's vein may be found several hundred feet below the vein in dispute, and the continuation of the disputed vein was thrown above the present surface of the mountain and has been eroded by the action of the elements.

Practically an equal number of witnesses testified for each party on the point whether the disputed vein was identical with plaintiff's vein. These witnesses were practical mining men, mining engineers, and geologists. Various maps and models were offered in support of one or the other theories. From this evidence, covering 655 pages of printed testimony, the District Court decided that the disputed vein is a continuation of plaintiff's vein, and the Court of Appeals has held that this decision is amply supported by the evidence, though acknowledging that there is a sharp conflict in the testimony.

THE MINING NEWS

LEADING EVENTS

Arguments Begun in Utah Consolidated-Utah Apex Suit

Hearings Opened Jan. 29, Lasting Three Days—Gray, Ellis, Lindley and Marshall Represent Companies Involved

Arguments in the Utah Consolidated-Utah Apex lawsuit were opened on Jan. 29 by John Gray, counsel for the Utah Consolidated company, who cited the decision in the Richmond Eureka and other cases. Mr. Gray gave a full review of the case and said that the limestone was prospected for ore in the Bingham district. He was followed Jan. 30 by Judge Lindley, counsel for the Utah Apex, who held that former decisions are not applicable here. Judge Lindley emphasized what he termed the human side of the case, which he said should be decided on its own merits. A detailed review of the case and testimony was given by Judge Marshall, counsel for the Utah Apex, who pointed out wherein former decisions differed.

On the last day, Jan. 31, after Judge Marshall had finished, the arguments were closed by Mr. Gray and Adrian Ellis, counsel for the Utah Consolidated. The latter laid stress on former decisions.

The case was taken under advisement by Judge Johnson. The decision is tentatively expected within sixty days.

Mason Valley Smelter Denied Special Freight Rate

According to information received from Washington by Chairman Shaughnessy of the Nevada Railroad Commission, the U. S. Railroad Administration has refused to grant the Mason Valley Mines & Smelter Co. a reduced rate on ores shipped from Paxton, California. The refusal is based on the ground that the existing contract between operators at Paxton and Utah smelters does not expire until Nov. 1, 1920. An appeal from the decision will be taken as soon as the railroads are returned to private ownership. The present rate from Paxton to Wabuska on $70 ore is $10.50, the distance being 182 miles. The same product is shipped from Paxton to the Utah smelters, a distance of more than 400 miles, for $8.

Some of the Minnesota ore roads have turned over large numbers of ore cars for use in distributing coal supplies throughout the Northwest. Although not designed for coal traffic, the cars have been of great value in the present emergency.

Fifty-Cent Bonus Discontinued at Tonopah and Divide

Cost of Living Reduced Equivalent Amount by Company Commissary —Tonopah Trades Assembly Protests

On the announcement of Joseph Lord, Federal Mediator, who is acting for the United States Department of Labor, that the company store recently established was functioning fully and effecting a great saving, the Tonopah and Divide Mine Operators Association has given notice that the bonus of fifty cents per day would be discontinued on Feb. 8. This decision has been accepted by the Tonopah and Divide Mine and Mill Workers Association which was organized several months ago. This is in accordance with the agreement made at the time the strike was settled, it being figured that the company store, selling goods practically at cost, would effect a saving of at least fifty cents per day.

Since the above decisions were announced the Tonopah Trades Assembly has appealed to the mine operators to reconsider and to continue the bonus. In its appeal it acknowledged that the commissary did reduce the cost of living at the opening on Jan. 5, but claims there has been a sharp advance in the price of goods during the month that it has been in operation and that everything tends to show that there will be a greater advance in the near future. Their contention is that "single men of the Tonopah district derive no benefit whatever and that the benefits derived from the commissary by a family of four could not exceed a saving of twenty-five cents per day per family as proven by actual experience through purchases made exclusively from the commissary." No action has yet been taken on this appeal.

On Aug. 15 last the operators, by way of compromising the industrial dispute, agreed to establish a commissary within sixty days and to sell necessaries to employees at cost plus operating expenses.

Guggenheims Buy Tin Mines

The firm of Guggenheim Bros., 120 Broadway, has acquired valuable tin mines in Bolivia, Edmund Guggenheim, a member of the firm, said recently. Mr. Guggenheim said that the value of the purchase ran into the millions. His brother, Harry Guggenheim, he said, is making a trip to South America partly to look over the mines. He said it was the first tin property to be acquired by the firm in Bolivia, although it already has extensive business interests throughout South America.

Government of India Adopts Gold Standard

Silver To Remain Legal Tender With Fixed Ratio to Gold—Currency System Re-organization To Facilitate Foreign Trade

The Empire of India changed from a sterling and silver basis to a gold basis on Feb. 2, according to a copyrighted dispatch in the *Sun and New York Herald*. The Secretary of State for India in council announced the adoption of a report by the Indian Exchange and Currency Committee and its recommendations go into effect at once so far as possible.

The main feature is that gold in the future will be the standard value in India and silver will remain a legal tender with the fixed ratio of one rupee for 11.30016 grains of fine gold. The committee recommended that the British pound, which now is rated by law in India as worth fifteen rupees, should be made legal tender in India at the revised rate of ten rupees. This provision, however, is not to be adopted at once because disruption would ensue in commercial affairs. For the time being, therefore, gold imports will continue to control and will be converted into rupees at the rate of fifteen to the pound.

The reorganization of the Indian currency system assumes great importance because of the huge volume to which foreign trade has grown and the consequent inconvenience in making payments to and taking payments from the outside world when silver, which is so hard to obtain, was the only metal that could be tendered in payment.

The currency report also goes into the matter of popularizing paper money in India. A system will be adopted providing for an issue of paper currency with a legal minimum metallic reserve of 40 per cent., the balance to be based on Government securities. The amount of this class of paper money necessarily will be rigid, expanding and contracting only as the metallic reserve or Government securities fluctuate. Such fluctuations might tend to contract the currency at the very time when active trade demanded expansion. To provide for such seasonal currency requirements an issue of paper currency by the presidency banks based upon commercial paper is to be permitted.

From this outline it will be seen that India's new system resembles that in vogue now in the United States, because part of the currency is backed by government bonds and metal, while the balance is based on commercial paper and is regulated in quantity by the needs of commerce.

Trial for Bisbee Deportations Opened at Tombstone, Ariz.

First Three Cases Called May Be Dismissed for Lack of Witnesses—Proceedings May Be Prolonged

The trial of two hundred and ten men charged with kidnapping in connection with the deportation of 1,186 striking copper miners and their sympathizers at Bisbee, Ariz., on July 12, 1917, was opened at Tombstone, Ariz., on Feb. 2. The first three cases called were marked by an announcement by the prosecution that dismissal of charges against the three defendants because of lack of witnesses was being considered. This was followed by the abrupt adjournment of the court. The prosecution requested time until the session on Feb. 3 to decide the question.

The three men, Fred Sandther, James Boyd and Phil Tovrea, were to have been the first defendants placed on trial. Robert N. French, county attorney, said that two of his most important witnesses against the men were absent from the state.

Attorneys for both sides agreed before court adjourned that whether the cases against Sandther, Boyd and Tovrea were continued or dismissed, the trial of H. E. Wootten, hardware merchant of Bisbee, should begin Feb. 3.

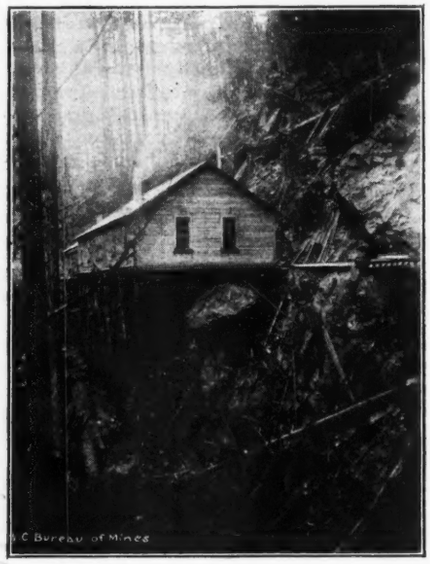
Engineer Mine, at Atlin, B. C., Examined

Attention again is directed to the Engineer mine, near Atlin, B. C., by the announcement that it has been subjected to a thorough examination recently by American engineers. The property has long been considered as one of the richest lode gold propositions in British Columbia. Although development has not been what may be termed extensive, much work has been done and, as far as it has gone, the results have confirmed all that its late owner, Captain Alexander, who lost his life when the S. S. Sophia foundered en route from the north, could have desired. Surface work has uncovered many veins ranging from 4 in. to 4 ft. in width. In a number there is visible gold and from two very rich ore has been taken. There has been an appreciable amount of underground development, consisting of a shaft, 275 ft. deep, and four levels. In the past the metallurgical treatment of the ore has been of the crudest character, the object apparently being to recover the heavy gold, the tailings being saved for shipment to the smelter.

Common report is that on the death of Captain Alexander the property fell to Allan Smith, a close associate, who had assisted financially in the opening of the property. Mr. Smith, however, died subsequently in the United States. The condition of the title, therefore, is a matter of doubt. From Atlin it is learned that the engineers who visited the property took away about 500 lb. of samples. Heavy machinery will be shipped in next month.

Consolidated M. & S. Co. Acquires Sunloch Group

It is definitely announced that the Consolidated Mining & Smelting Co. of Canada has taken over the Jordan River properties, Vancouver Island, known as the Sunloch Group. These have been under development for some time, about 1,000 ft. of cross-cutting and drifting and 500 ft. of diamond drilling having been done. Besides this there has been constructed some 6,000 ft. of automobile road. A four drill compressor plant has been installed and a new building erected. A track also has been laid from the mine to the waterfront. The Consolidated



BUNK HOUSE AT SUNLOCH MINE, VANCOUVER ISLAND, B. C., WHICH PROPERTY HAS BEEN TAKEN OVER BY CONSOLIDATED M. & S. CO.

company is expected to pursue development energetically. It has been known for some time that the Consolidated company was interested in this property, but not until now has a definite statement been authorized.

Japan-Flora Stockholders Lose Entire Equity

Stockholders of the Japan-Flora Mines & Tunnel Co., whose property in San Miguel County, Colo., was sold by the sheriff on Nov. 22, 1919, under foreclosure proceedings, have been notified by the secretary of the company that they have thereby lost their entire equity in the property. The secretary states that representatives of the bondholders bid in the property for $251,200, the exact par value of the outstanding bonds, and that the chances of the company being able to redeem the bonds are remote.

The notice concludes by reminding stockholders that they should deduct the full amount of their investment in this stock in making their Federal Income Tax return for 1919 in accordance with the rules and regulations of the Treasury Department. The law, it is stated, requires this.

Safety First Prizes Awarded by Calumet & Arizona

Accidents Decreased 57 Per Cent Since Movement Was Inaugurated in 1914—Improvement Expected in 1920

Safety first has taken a strong hold among the employees of the Calumet & Arizona Mining Company. When the annual meeting of the safety department was held on Jan. 25 at Lowell, sixteen of the twenty-eight shift bosses employed by the company received prizes awarded for having worked 2,500 individual shifts without an accident among the men under their immediate supervision. In order to attain a perfect record a boss working 50 men would have to work 50 shifts without a single injury to any of his men. Prizes were distributed to George Graham, R. B. Linden, J. F. Ward, P. V. Banks, Ted Dunlap, J. C. Lackner, Tom Mason, Norman McKenzie, William Sharp, M. E. Kaum, all of the Briggs mine; N. J. Cosgrove, J. R. Wester, John Saunders, W. D. Harrington, Tom Fuller, Jacob Erickson, M. K. McCrea and George Matzell, all of the Junction mine.

Thomas Cowperthwaite, safety supervisor for the company, who presided over the meeting, said that since the movement was inaugurated in 1914 a decrease of 57 per cent had been attained. It had been thought that 1918 marked the lowest possible number of accidents, but so strongly had the "safety first" idea become entrenched among the men that 1919 showed still further decrease. It is hoped to make an even better record in 1920.

In 1911 the Anglo-Colombia Development Co., Ltd, of which Lord Brabourne is managing director, was organized to take over properties in the ancient gold and platinum placer fields in the Condoto River, Intendencia del Choco, Colombia, South America. War conditions introduced difficulties common to all the dredgers in that field, and in October, 1916, the English company arranged to combine its properties with the financial resources and properties of the Lewisohns, of New York, who were in the same field. An American organization, the South American Gold & Platinum Co., was then incorporated in Delaware, to manage the consolidated interests. Up to the present the current yield of the gold and platinum has been from a single small wood-burning dredge of 400,000 cu.yd. annual capacity, yet the 1918 production approximated $600,000. The company is now floating a steel dredge of 1,000,000 cu.yd. capacity, and additional dredges are being designed to embody improvements suggested by the preliminary operations. The first steel dredge should have begun work on Jan. 1, 1920, and it is expected to run more nearly full time than its wooden predecessor. The gravel handled in 1920 should be several times the amount worked in 1918.

Events in Norway and Sweden

Kristianssands Nickel Co. Increases Capitalization—Sulitelma Mines Closed—Other Operations

At the last general annual meeting of the A. S. Kristianssands Nikkel-Raffinerings Verk it was decided that the present capital of 5,000,000 kroner be increased by 5,500,000 kroner by a new issue of 11,000 shares of 500 kroner, at par. It was considered probable that the increase would be devoted partly to finance the British America Nickel Corporation and partly to extensions of the refinery at Kristianssand. The directors had inspected the works in Canada and had found all in order and according to plans. Owing to enhanced prices of material and labor the estimated cost had been exceeded. This would be met by the A. S. Kristianssands Nikkel-Raffinerings Verk in order that work might be commenced this year.

In addition to the increase of 5,500,000 kroner, a further issue of 17,500 shares was decided on, partly for exchange of dividend certificates, and partly for the acquirement of patent rights and the share majority in the Outokumpu Copper Mines. The Company's share capital would thus be increased to about 19,000,000 kroner, of which 5,000,000 kroner would be 10 per cent cumulative, limited preference shares. The dividend for 1918 was 10 per cent on the shares and 100 kroner on dividend certificates.

Interviewed by "Aftenposten" on his recent return from London, Admiral Boerresen stated that the great works near Ottawa, Canada, would have a capacity output yearly of 10,000 tons of nickel, and 6,000 tons of copper. At the mines in the Sudbury district there was a reserve of 20,000,000 tons of rich ore, he asserted. A shaft had been sunk to a depth of 1,200 ft., with a hoisting capacity of 1,500-2,000 tons of ore per day. He expected that the first delivery of nickel would be made in January, 1920. Asked who were the owners of these works, Admiral Boerresen said they were owned almost entirely by Norwegian shareholders, together with the British Government. Up till the present the outlay on the works was $16,000,000. "And how will the product be distributed?" asked the interviewer. "For the present," replied the Admiral, "we need not trouble ourselves about that side of the question. The British Government bought the whole of the first eight years' production." "Bought during the war?" "Yes." "But now that the war is over has the British Government, as such, so pressing a need for nickel?" "There will always be a very strong demand for nickel," replied Admiral Boerresen. "Remember, that, as a raw material it is indispensable in a range of industries. Think of its part in steel production alone!"

At the general meeting of A. S. Evje Nikkel Verk, Admiral Boerresen in the chair, a dividend of 8 per cent was announced. Owing, no doubt, to a great extent, to the heavy annual item of damages to the neighboring forests, it has been decided to move A. S. Evje Nikkel Verk's smeltery from Evje, in Saetersdalen to Kristianssand.

Because of the need for electroytic copper last year the Kristianssands Nikkel-Raffinerings Verk were, by royal decree, compelled to turn over from the refining of nickel to the electric smelting of copper, and also to re-treat from nickel-copper matte up to 400 tons of copper.

Sulitelma Copper Mines Closed Down

The Sulitelma copper mines, situated in Norway though owned in Sweden and employing about 1,000 men, have been closed down indefinitely and the employees paid off. The management gives as one of the reasons for this step that the company has on its hands about 60,000 tons of unsold ore, which practically amounts to about a year's output. The net profits for 1916 and 1917 were 3,266,000 kroner, and 3,600,000 kroner, with a dividend of 18 per cent, the figures for 1917 have only recently become known and it is estimated that the results for 1918 will be on about the same level. It is rumored that the new interests who recently acquired share control for about 40,000,000 kroner have had no return on the outlay.

NARROW-GAGE RAILROAD AT SUNLOCH MINE, VANCOUVER ISLAND, B. C.

Molybdenite Company Formed

A. S. Molybdaenproducter is in the course of organization, capitalization being a maximum of 500,000 kroner, with the objects of distributing the crude ore, the production of molybdenum and products, and their sales, and by technical and experimental work to forward the industry, and to increase mine production. The prospectus states: "Our country has the best conditions for the molybdenite industry. The Norwegian occurrences of molybdenite are of the most considerable in the world, and it may be taken for granted that our reserves of molybdenite glance are sufficient to secure to our country an overwhelmingly strong position in the world's market."

Government Buys A. S. Grong Copper Co.

Practically all the shares of the A. S. Grong Copper Co. have been acquired by the Norwegian government and plans are made for the further systematic exploitation of the company's extensive pyritic property at Grong, near the Swedish border. It is thought that the ore will be sent by rail to Namsos for shipment.

Kongsberg Silver Mines Must Change Methods

With reference to the Kongsberg silver mines the Norwegian surveyor of mines has stated that, in his opinion, there are sufficient reserves immediately available for an annual output of 10,000 kg. of silver over a period of ten to twelve years; but that unless the present system of unnecessary surface work at the expense of underground development is modified, the results, economically, may be disastrous.

Orkla Copper Co.'s Program

The Orkla Copper Co. is committed to a very considerable increase in equipment and development extending over a period of eight years, when the estimated number of men employed will be about 1,500 and the annual shipment of pyrites about 500,000 tons or practically equal to the whole of Norway's present output. The mines are situated in the Trondhjem district, and the cost of the work referred to will be about 15,000,000 kroner.

Titanium White from Ilmenite at Fredriksstad

The Fredriksstad factory in Norway has been successfully producing titanium white by chemical processes from the ilmenite ores at Rackefjord, on the southern coast, and when working full the output is expected to be about 8 tons per day. The ore carries about 40 per cent titanium oxide, and 32 per cent iron oxide.

Operations at Porjus Smelter

The Porjus Smelting Works (Swedish), the world's most northerly of its kind, have had three furnaces for ferro-alloys in operation since 1917, and an electric mass furnace of 3,000 kw. since March, 1919. The capacity of the latter is 24,000 tons per year, that is, 18,000 tons of Martin pig iron and 6,000 tons of ferro-alloys. As compared with the ordinary mass furnace, the charcoal consumption of this electric mass furnace is less than half as much per ton. Power is obtained from the state under contract at the low figure of 30 kroner per hp.-year, and the company has provided, in advance, for the necessary supply of 60 per cent iron ore at 10 kroner per ton delivered. The product can be exported from the port of Narvik.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

McFadden Silver Bill Opposed by Director of Mint

Official To Appear Before Committee on Banking—Sponsor of Measure Again Attacks Bi-metallism

The Director of the Mint and other authorities on the monetary system are to be heard in the future by a subcommittee of the House Committee on Banking and Currency on the McFadden Silver Bill. This bill amends the Pittman Act so as to remove the limit as to the number of standard silver dollars that may be melted and makes no provision for the repurchase of a like amount of silver bullion. The Pittman Act provides for the melting of 300,000,000 standard dollars and the sale of the bullion. It also requires the Government to repurchase the same amount of silver bullion at $1 an ounce. The McFadden bill also amends the revised statutes by providing that subsidiary silver coins shall be 80 per cent fine instead of 90 per cent.

While no announcement has been made by the Director of the Mint or the Federal Reserve Board as to their position in connection with the McFadden Bill, it is thoroughly understood that they are opposed to it.

Representative McFadden at a recent hearing on his bill advances the following reasons for the repeal of the repurchasing clause of the Pittman Act: "Because it is another attempt to experiment with the false theory of bimetallism; because the Government has enough financial burdens to bear without again incurring the expense of experimenting with this false theory, and because we can never maintain an effective open discount market for commercial paper so long as we insist on the bi-metallic fallacy."

Mr. McFadden insists that it is time to stop "bi-metallic foolishness."

"The silver producers will make no complaints," said Mr. McFadden, "so long as that metal remains at anything like its present price, but the moment silver experiences a considerable decline in price we will have its producers coming to Congress and begging for Government aid, asking us to boost the price of their commodity with Government credit, just as former Congresses did, at an enormous expense to the Government, and to the serious detriment of our whole credit system."

The hearing also brought out that up to the end of 1919 260,121,554 silver dollars had been melted under the Pittman Act. The number of fine ounces of silver resulting was 200,805,323. Of the resulting bullion 200,032,326.646 fine ounces were sold to the British Government for $203,370,541.63.

House Committee Inclined To Consider Question of More Liberal War Mineral Legislation

Chestatee Evidence Held Extraneous by Many to Real Issue Involved—Members Impressed With Commission's Work—Chrome Operators' Hearings Begin

After having listened to extended testimony bringing out the policies pursued by the War Minerals Relief Commission in its rulings in the case of the Chestatee Pyrite & Chemical Corporation and as to its procedure in chrome cases, it is apparent that the House Committee on Mines and Mining, generally speaking, is favorably impressed with the way in which the commission has conducted its work. Interpretations which have been made of the law by the Attorney General and by the solicitor for the Interior Department have not met with the same general approval. With a few exceptions it seems to be the opinion that the commission has done about as well as it could with the restrictions placed upon it first by Congress and later by the interpretations of the law.

Many of the members of the Mines and Mining Committee of the House are of the opinion that most of the evidence taken in the Chestatee case has been extraneous to the resolution which the committee is considering. The hearing has had the effect of calling the attention of Congress again to the matter of war-minerals relief and has caused an inquiry to be raised by members from agricultural districts as to whether Governmental relief could not be extended to their constituents, since agricultural production was stimulated directly by the Food Administration and the Department of Agriculture and serious losses were experienced with the ending of the war.

Senator Shafroth, the chairman of the War-Minerals Relief Commission, brought out very clearly that it was the conferees for the House who were responsible for the limiting clauses which have proved most embarrassing in the effort of the commission to extend equitable relief. In pointing out the view that the commission took in the matter, he called attention to the fact that the Senate had liberalized the war-minerals legislation to the extent of putting in the word "published." The House conferees, however, absolutely refused to accept that further liberalization and went even further and put on other limiting clauses.

Both Representative Raker, of California, and Representative Sinnott, of Oregon, took exception to the interpretation of the law which requires a personal request. Representative Sinnott in his argument used as an analogy the publication by police officials of an offer of reward. He cited precedent to show that such an offer of reward may be accepted by any part of the public, or by any particular person, and that it is not necessary for the person performing the service for which the reward is offered to give notice that he accepts the offer.

Representative Raker called attention to the methods used by Albert Burch, a representative of the Bureau of Mines, in his activities looking to the stimulation of chrome mining. He read from a pamphlet entitled "Chrome," by Mr. Burch and by Samuel H. Dolbear, in which it was stated that "each thousand tons of ore produced in California will enable us to face the Kaiser with two thousand more men. The U. S. Government in these critical times cannot permit production to cease and the owner who becomes involved in disputes and causes the cessation of production is little better than a traitor." These were statements made in published form by a Government agent, who was described as a man of high standing in California. At meetings and in conversations Mr. Burch and other Government agents were said to have used even stronger statements in their efforts to increase the production of chrome.

Mr. Raker compared the law to the selective draft. He pointed out that each individual was not required to have personal notice to register but that official announcement is always taken as sufficient notice for the citizen to comply with the Government's request or demand.

E. A. Dickey, the secretary of the Pacific Coast Chrome Producers' Association, called the attention of the Committee to the fact that the Government is doubly responsible for losses to those who attempted to produce chrome, from the fact that importations of chrome were allowed to such an extent that the market was glutted even before the armistice, with the result that chrome producers found no market for their ore before there was an indication as to when the war would end.

Mr. Dickey took exception to the commission's attitude toward net losses. In reply to the criticism, Senator Shafroth said:

"We think that Congress never would have passed a relief measure if it had known that during the period of the

war more money was made by the claimant than he lost as the result of producing chrome. We think where large profits were made up to, say, May, 1918, and yet after that period losses were made, that Congress did not intend to relieve such cases.

"The Government does not attempt to show the date of stimulation. It is the claimant who does that. The claimant sometimes can point out whether he acted on early stimulation or not. He can say he did not construe the talk with the first engineer as a request to produce, but when another engineer came to his mine later he took it as a request. He may have made money up to the time the second engineer came and lost money after that. I don't care what Congress does. If it wants to recognize all of these claims and give all the profits that were made to men who made profits, all right. I have no criticism. We are not making the law, but construing it only. There are some of these claims that show as many as fifteen or twenty operations going on at the same time. Some put in a claim for each, and some who made money did not put in any claim whatever. We construe that the net losses made by the individual, no matter in how many transactions, should be considered. If he made money on the whole, then we say that there is no liability. If he made a certain amount and it is less than his losses, then we simply deduct the profits from the losses and give him the net losses."

Mr. Dickey's contention was, however, that profits from a "no request" mine should not be taken to offset losses incurred in a Government stimulated property. He also contended that the commission is not adopting the proper method to determine whether or not mines are of commercial importance. His belief is that just because the ore in sight is not promising at the time of the visit of the Government engineer, the classification of the mine as not being of commercial importance is unjust, because "the Government engineer is just as liable to be wrong as he is to be right."

Awards by the War Minerals Relief Commission up to Jan. 10, the last report, totaled $576,781.78. The expenses of the commission up to that date aggregated $173,000. These sums deducted from the original appropriation of $8,500,000 leave at the disposal of the commission a balance of $7,750,218.22.

To the date of the most recent report, forty-three claims had been acted upon. The total amount asked by these claimants was $1,904,405.23. Thus only 30 per cent of the amount claimed has been recommended for payment.

Representative Wingo of Arkansas, one of the members on the Committee of Mines and Mining, during the course of the hearing said that frequent complaint had been made to the commission that the will of Congress had not been carried out. Mr. Wingo was referring to the delay in opening the present hearing.

Hearing on Tungsten Tariff Bill Reopened

Hearings on the Tungsten Tariff Bill were reopened Jan. 28 by the Senate Sub-Committee of the Committee on Finance in order to hear the high-speed steel interests. B. F. Witbeck, of the Ludlam Steel Co., expressed this view: "It seems hardly fair to place a duty on this kind of raw material which involves at the very most 10,000 persons in the United States, including the families of the miners, as against the hundreds of thousands of people who are concerned in the steel industry. You are protecting one-two-hundredths of 1 per cent, as against several per cent of the population."

The steel makers contended that if a duty of $1 per lb. is placed on ferrotungsten and tungsten metal, a duty of $1.50 per lb. should be placed on tungsten contained in steel. This claim was based on the contention that losses are suffered in the process of making steel, through scale, oxidation, and scrap. The loss of tungsten by these means and the cost of labor, it was figured, would make it necessary to place a higher duty on the tungsten-containing steel.

Nelson Franklin, of Denver, who represents the producers of tungsten ore, was present at the hearing and took issue with various points made by the steel men. He expressed the opinion that some provision should be made for the tungsten and high-speed steel, but suggested that a duty of $1.50 would be generous. He also contended that tungsten could not only be recovered from scrap but also from scale.

Mr. Witbeck had based some of his calculations on an annual consumption of 15,000 tons of tungsten. Mr. Franklin contended that the normal requirement does not exceed 7,500 tons annually.

In the course of the colloquy between Messrs. Franklin and Witbeck, Mr. Franklin asked what would happen in the case of war with China if American tungsten mines were closed. To this Mr. Witbeck replied: "I think if you were to take some of the $12,000,000 you made in 1916, the $10,000,000 you made in 1917, and the $5,000,000 made in 1918 we could set a part of that aside as a sinking fund for tungsten mine development in the event of war." This led Senator Phipps to say, "You will have to get some of that money back which has been paid to the Government in the way of excess profit tax, would you not? Just like your high-speed steel industry, the mines had to account for their profits and pay their taxation accordingly."

Reply of Douglas to Graham in Congressional Record

At the request of Senator Ashurst, of Arizona, the reply of Walter Douglas to the Graham charges against the copper producers, which was printed in the *Engineering and Mining Journal* of Jan. 10, was reproduced in its entirety in the Congressional Record of Jan. 22, 1920.

Magnesite Situation Described by Tariff Commission

Present Advantage Lies With Foreign Producers—Austrian Labor Cost 23 Per Cent of Total

A concise digest of available information on magnesite has been presented to the Senate Committee on Finance by the U. S. Tariff Commission. Extracts from the report are as follows:

"With the return of normal shipping conditions, the American magnesite industry faces the prospect of a serious relapse—almost to the pre-war level. Recently developed deposits in Venezuela may be expected to furnish some material to Eastern markets in competition with that from Greece and Canada, but Austrian magnesite will dominate the market if delivered at anything like pre-war prices, which are as low at the Atlantic seaboard, practically the point of consumption, as quotations of the domestic product on the Pacific Coast. Under these conditions, the domestic output would be restricted to the markets west of the Mississippi, where the consumption is comparatively small. The definitive line is dependent upon the balance of ocean trade from foreign countries and domestic rail tariffs from the Pacific Coast, but the advantage lies with the foreign producers.

"A recent estimate of the character of the consumption is that 82 per cent of the magnesite consumed in the United States is used as refractory, 15 per cent in the plastic trade, and 3 per cent for chemical and medicinal purposes. The openhearth steel industry is largely dependent upon magnesite supply. The partial substitution of dolomite, however, has come to stay, and the amount of magnesite consumed per ton of basic openhearth steel, which formerly was 6 to 14 lb. (dead burned) lately has been cut almost in half. The total amount used by the steel industry has not decreased, on account of the much greater output of basic openhearth steel. The use of magnesite in the building trades also has increased to a marked extent.

"Sworn statements of five of the largest magnesite companies operating in 1919 have been filed with the Tariff Commission, showing an average cost of production of $25.37 per ton (calcined magnesite) at the shipping point. In three of these reports the direct labor cost is indicated, averaging 50 per cent of the total. The Department of Commerce recently has received figures on Austrian cost of producing magnesite, indicating that of total cost f.o.b. Trieste of $12.80, $2.89, or 23 per cent, is the cost of labor.

Relief for the gold industry is planned in a bill, already prepared and submitted to several representatives of the producers, bankers and manufacturers. This legislation, authorized by the St. Louis Convention of the American Mining Congress, is in charge of Harold N. Lawrie, gold economist of the Congress.

Chrome and Cobalt Tariff Bills Introduced

A tariff on cobalt oxide is provided in a bill introduced by Representative Rhodes of Missouri. The bill also provides that all importations shall be estimated at the port of entry and a bond given of a sum double the amount of the estimated duty so that the material may be shipped to properly equipped sampling establishments. The bill provides that it must be sampled according to commercial methods under the supervision of Government officers.

Senator McNary of Oregon has introduced the bill providing duties on chrome and chromium ores. On crude chrome ores and chromium ores and their concentrates the duty is to be 60c. per unit of Cr_2O_3 content. On ferro-chrome and other metallic alloys containing chrome the duty is 11½c. per lb. of metallic chromium contained. On refractory brick and material used for refractory purposes the duty is to be 65c. per unit of Cr_2O_3. On chemical compounds and manufactured articles containing chrome or chromite the duty is to be 90c. per unit of chromium content.

House and Senate conferees on the Oil Land Leasing Bill reached an agreement on Feb. 2 after a prolonged deadlock lasting three months. An effort to obtain immediate consideration of the conference report by the House will be attempted.

NEWS BY MINING DISTRICTS

ALABAMA

Tennessee C. & I. Co. To Blow in Four More Furnaces—Outlook for 1920 in District Bright

Birmingham—The Tennessee Coal, Iron & Ry. Co. is contemplating the blowing in of four additional furnaces at Bessemer, Ala. These four furnaces have been under repairs for several months past. This company's No. 2 furnace in Bessemer is being relined for ferro-manganese and should be ready for operation during the next few weeks.

The present year is expected to prove the best yet in the experience of the Birmingham district. All the iron that can possibly be made during the first six months is sold or being eagerly sought. Steel mills, machine shops and pipe manufacturers report orders enough to run them a number of months and great things are expected when the railroads go back to private control as it is known that they will need steel rails and other products in the vast improvements necessary. Just what may develop in the way of improvements and additions by the Tennessee Coal, Iron & Ry. Co. is not known but it is naturally expected that the completion of the shipbuilding and fabricating projects during the past year will cause the consideration of further construction plans, one of the most talked of being the aerial tramway from the company's ore mines on Red Mountain to its steel plant in Ensley. The company is also considering an extension of its railroad, the Birmingham Southern Ry., to the Warrior River.

The by-product coke oven industry in the district is making great strides forward. The Birmingham Coke & By-products Co. is expecting to start a battery of Koppers ovens in the near future. The 120 Semet-Solvay by-product coke-oven plant of the Sloss-Sheffield Steel & Iron Co. will soon be completed. A battery of 77 Koppers ovens of the Tennessee Coal, Iron & Ry. Co. at Fairfield has been completed and will be followed soon by another battery of 77 Koppers ovens.

Many companies, owing to the strong iron market, are preparing to increase their output in a short time. In addition to the four Tennessee Coal, Iron & Ry. Co. stacks soon to begin operations the Sloss Sheffield Steel & Iron Co. is working on two stacks, one in North Birmingham and one in the Sheffield district.

Alabama produced about 200,000 tons of pig iron in December, 1919, this bringing the total for 1919 close to the 2,100,000 ton mark. The production during the last half of 1919 was much better than in the first half of the year and leads operators to believe that 1920 will be a banner year in the iron industry in Alabama.

ARIZONA

Copper Queen's Holbrook Mine Shut Down—State of Texas Property Likely To Be Re-opened

Bisbee—The Holbrook mine of the Copper Queen Branch of the Phelps Dodge Corporation, has been closed and the men working in it, 115 in number, transferred to the Gardner, Sacramento and Czar shafts without loss in position or pay. The reason assigned for the close down by the management was that the orebodies latterly had become so low in grade that they could not be worked at a profit under the existing copper market. However, should the market rise again, it is anticipated that the Holbrook would be re-opened immediately. Before the shutdown the employees of the mine worked for a week or more filling old stopes, catching up loose ground and otherwise preparing the territory for a long state of inactivity. The Holbrook is the second oldest mine in the Warren district, being antedated only by the Czar. However, the present shaft is comparatively new, having been sunk after the original shaft was lost through caving in 1906.

Douglas—With the object of studying crushing plants in operation at the Copper Queen and C. & A. smelters at Douglas, three department executives of the United Verde Copper Co. at Jerome, spent Jan. 28 and 29 at Douglas. United Verde is about to erect a crusher of approximately 2,500 tons daily capacity and it is desired to incorporate in it the latest approved methods of crushing. The members of the investigating party were Thomas Taylor, smelter superintendent; Charles Kuzell, assistant smelter superintendent; and C. M. Hoffman, superintendent of machinery.

Tombstone—Maurice Clark, consulting engineer, has returned to Douglas after accompanying Douglas Gray of Tombstone, to the State of Texas property, owned by Mr. Gray, situated in Moctezuma Canyon in the Huachuca Mountains. The mine has been idle for several years. While on the property, Messrs. Clark and Gray sampled it and made thorough inspection of underground workings and surface improvements. Deposits of ore were found underground, in a contact between lime and porphyry. The main vein is from 6 to 16 ft. in width carrying silver, lead and zinc. This has been developed by the main shaft, 357 ft. deep, which has workings on two levels. Another vein, 3 ft. wide opened up in a shaft 50 ft. deep, carries copper and silver. Considerable copper ore also has been opened in the workings leading from the main shaft. Most of the ore is sulphide. The main shaft is equipped with a gasoline hoist and a steam-driven Cameron pump. Surface improvements include an assay office, boarding and bunk houses providing accommodations for 30 employees. A small stream flowing past the property, together with the discharge from the mine, will provide sufficient water for operation of a 50-75 ton mill.

Courtland—H. D. Palmer of the Flux Mining Co. was in Courtland Jan. 26 to supervise the loading of mining machinery purchased at a bargain price by his company from the estate of the late Charles O. Ellis, of Douglas, the price having been slightly more than $5,000 for surface and underground equipment sufficient to operate almost any small property. It included a new 40-hp. engine, a 25-hp. Fairbanks-Morse gasoline engine, an Ingersoll-Rand compressor and a new air receiver with jackhamer drills and new steel, 350 ft. of steel cable, headframe, a wooden cage, and a miscellaneous assortment of hand steel and

small tools, tanks and other equipment. The machinery was expected to be delivered at Patagonia, Santa Cruz County, in a few days and to be in operation at the Flux mine near there within two weeks. Underground development at the Flux continues encouraging, the face of the drift on the 260 level still being in ore, the vein leading in the direction of the Glory Hole deposit which has been opened on the higher levels.

CALIFORNIA

Operations on Mother Lode—Development Work Suspended at Rising Star Mine by Bully Hill Co.

Grass Valley—The west tunnel in the Allison Ranch mine has been driven more than 1,000 ft., and is believed to be approaching the Hartery ledge.

Sierra City—R. H. Gillespie, operating the Cleveland and Monarch mine, has built a power line from the powerhouse near Loganville to the Cleveland mine. The line will furnish electric power for the Cleveland plant, including the twenty-stamp mill.

Sutter Creek—The shaft of the Old Eureka has passed the 3,200 level. When down 3,500 ft. sinking will cease and work of opening up new levels will be pushed. An 8-ft. vein of promising ore is being prospected on the 3,000 level.

Amador City—A crosscut is being run on the 2,100 level eastward in the hope of intersecting a vein of valuable ore.

Jackson—A huge cave-in 90 ft. long by three sets wide on the 4,000 level of the Kennedy mine recently injured nobody. The damage is being promptly repaired. The mill is dropping between 25 and 40 stamps. One hundred men are employed.

Angels—J. W. Maltman, with backing of Eastern capital, will open up and operate the Cherokee mine. A crew of men is at present unwatering and retimbering the shaft.

The Carson Hill Gold Mines has let a contract to the Angels Iron Works for a 10-stamp mill. This will make a total of 30 stamps.

Soulsbyville—The Black Oak mine is at present stoping on the 18th level where the recent strike was made. The vein is averaging 2½ ft. of first-class ore. Short mill tests will be made from time to time.

Winthrop—Development work at the Rising Star mine has been suspended by the Bully Hill Mines, Inc., and the force cut to 20 men, until the first unit of the zinc reduction plant is completed.

Bakersfield—The Blue Mountain Gold Mining Co. is continuing development of the Blue Mountain mine. About 20,000 tons of ore are now in sight. The company proposes to continue development work until 60,000 to 70,000 tons of ore are assured for milling, when a 20-stamp mill will be constructed.

COLORADO

Developing Important Strike at Early Bird Near Ouray

Ouray—What promises to be a real "strike" is being developed at the Early Bird by A. E. McCormick and associates. The Early Bird is on the north slope of Houghton Mountain opposite the Ben Butler and London on the eastern side of the old Mineral Point district. Operations by the Pueblo owners last year netted but little; the present operators, under bond and lease, began in the same workings and by simply crosscutting a foot or two into the wall, discovered a body of high-grade silver ore. This had been hidden behind a false wall for years. The ore consists of two to three feet of gray copper high in silver, assays returning as high as 1,400 oz. per ton, with two feet more of 50-oz. ore. Shipments are now being made by pack train. If weather permits shipments to continue, mine buildings and equipment will be provided at once.

Not far southeast of the Early Bird, down the gulch toward Animas Forks, operators on the Columbus, under the name of the Gnome Mining Co., Silverton, have opened a wide body of very good lead-silver ore carrying some zinc. Some of this is high in silver. This is a substantial discovery which may prove the making of a mine by next summer.

MICHIGAN

Iron Ore Prices for Coming Season Awaited—Verona Co. to Operate Amasa Porter

Gogebic Range

Ironwood—The matter of prices for ores for the coming season is now holding the interest of the iron mining men. An increase over last year's prices is absolutely necessary if the independent miners are to keep going; where mines and furnaces are owned by the same company the price of ore is not so vital. Past increases in prices of ores have been small compared with increases in wages and other production costs. As yet no official announcement has been made as to what extent the Steel Corporation's latest wage increase will affect the employees at its various mining properties.

On the whole the Gogebic Range mines are operating at nearly the usual winter rate, in spite of the fact that they were left with large stockpiles on hand last fall.

The Tilden mine at Bessemer is continuing development of its 11th level orebody with gratifying results. The ore has been followed up 260 ft. above the level; it appears to be 40 or 50 ft. wide, and its length has not yet been determined. A new level is being cut out in No. 10 shaft about 140 ft. above the 11th level. It is expected this shaft will soon be improved by equiping it with the first-motion hoist and steel headframe from "A" shaft of the Aurora mine, which was abandoned last summer. This would permit a considerable increase in production at No. 10.

Menominee Range

Crystal Falls—Operations are to be resumed at the Bristol mine before Mar. 1. Some repairs are now being made. A new electric pump has been installed underground. There is considerable ore in stock, as little was moved in 1919. This is the third Crystal Falls mine to be re-opened recently.

Amasa—The Amasa Porter mine was taken over a few weeks ago by the M. A. Hanna Co. from the Nevada Land Co. and has now passed to the Verona Mining Co., a subsidiary of Pickands, Mather & Co., and will be operated this year. New hoisting and pumping machinery is to be installed. The machinery will be operated by electricity if the Twin Falls Power Co. will extend its lines to the property. No mining can be done until spring, as all stockpile room is filled.

Stambaugh—Diamond drilling for new orebodies at the Berkshire mine is to start soon.

MISSOURI-OKLAHOMA-KANSAS

Joplin-Miami District

Webb City-Carterville—Revival in operations in this camp has been recorded recently. T. F. Coyne, of Webb City, bought the lease recently developed south of Carterville by the Webb City-Carterville Community Drilling Co. for $16,000 and 5 per cent royalty. He is continuing with prospect drilling and has started a shaft and will erect a small mill, probably of about 150 tons' capacity, inside the next 60 days.

The Miller Mining Co. has taken a lease on the Concord mine and mill, situated in the southern outskirts of Carterville, and has started operations after securing leases on various town lots to the boundaries of which the ore had been cut when operations at the mine were stopped about a year ago. L. B. Miller, of Carterville, is general manager.

The Ten O'Clock Mining Co. is putting machines in the ground at the old Ten O'Clock mine at Prosperity, south of Carterville, and is preparing to operate the mill steadily. Only light operations for lead ore have gone on at this mine for several months. S. D. Eurit, of Carterville, is manager.

The Center Creek Mining Co. has leased the compressor at the Orange mine, and is starting up the old Jewel mine, in the northwestern part of Carterville. There is also renewed activity in shallow mining on this tract. J. E. Womack, Webb City, is manager.

MONTANA

Anaconda To Make Zinc Oxide and Arsenic Trioxide—Elm Orlu Opens New Vein Below 2,000 Level

Butte—The Anaconda Copper Mining Co. is planning to manufacture zinc oxide at its electrolytic zinc plant at the Boston & Montana works at Great Falls, Mont. It will be possible for the company to produce in oxide approximately 2 per cent of its zinc output, which, with the electrolytic works op-

erating at capacity, will amount to three tons daily. The zinc plant has a capacity daily of 150 tons, but at present is operating only at 50 per cent. The company is also planning to produce trioxide of arsenic on a large scale. Crude production of arsenic from the Cottrell fume treaters will begin within a month. Before the construction of the Cottrell treaters the greater portion of the arsenic was wasted. The company's chemists have been experimenting with a view of making an insoluble arsenical glass.

The drift on the 3,400 level of the Edith May fissure at the Granite Mountain property of the North Butte Mining Co. is within about 60 ft. of a point under the 3,200 level where one of the best orebodies the North Butte has opened in years is situated, showing a width of 24 ft. of 6 per cent copper rock. The hoisting plant at the Speculator shaft of the North Butte has been overhauled preparatory to beginning of hoisting operations there. This will materially increase the tonnage output of the company, which now is lifting approximately 2,000 tons daily.

Sinking of the No. 2 shaft of the Butte & Superior Mining Co. is under way, with the 2,300 level as the objective. The ore showing on the lower levels has been greatly improved within the last eight months, and the company has more than made up the amount of ore it lost to the Elm Orlu in the recent suit, which was estimated at about 25 per cent of its reserves. The company has increased its reserves, it is said, more than 35 per cent.

Opening of a "northwester" vein on the 2,200 level of the Elm Orlu with its apex below the 2,000 level, where there is no sign of the fissure, is a noteworthy recent development in the Butte district, as it indicates the possibilities of development at depth in the northwest vein series. This new vein is of high-grade copper.

NEVADA

Con. Virginia's New Officers—W. J. Loring Has Option on Ingalls Mine—Other Operations

Rawhide—Activity is increasing somewhat at Rawhide, several lessees being at work on the Grutt property, as well as on that of the Nevada New Mines Co. One or two carloads of ore are being shipped each month, values running from $30 to $60 per ton.

Virginia City—The following officers of the Consolidated Virginia Mining Co. were recently elected: President, Whitman Symmes; vice-president, Frederic Vincent; A. P. Swain, secretary; Zeb Kendall, J. J. McDado and J. H. Goldman, directors. There are about 300 men employed in and about the mines of Virginia City at this time.

Lafayette—The shaft at the Lafayette mine is now down 200 ft., and crosscutting has started. On the 100 level the vein is 17 ft. wide, five feet of which is said to carry good values.

J. L. Giroux, formerly associated with Senator Clark, will soon start work on the Rickey Boulder group, which he recently bought.

Golconda—L. Kramer is developing his mine at Iron Point, near Golconda, and shipped a carload of high-grade silver ore recently.

Tule Canyon—W. J. Loring and associates have taken an option on the Ingalls mine in Tule Canyon, south of Goldfield. This property has been producing in a small way for several years, but if development warrants the taking up of the option it is probable that it will be worked on a large scale.

Rye Patch—The old Rye Patch mine, which produced much rich ore from shallow workings 50 years ago, is being again operated under the direction of H. E. Clement, who is said to have recently opened up some fair-grade ore.

Pioche—Ore shipments from the Pioche district for the week ended Jan. 9 were as follows: Prince Consolidated, 1,100 tons; Virginia-Louise, 650; Bristol Mines, 150; Black Metals, 350; and the Pioche Assay Office, 100; total, 2,350.

The Black Metals mine is again operating normally and is shipping a large tonnage of silver fluxing ore to the smelter at Salt Lake. G. F. Schrieber, mining engineer, reports that development on the 325 level is advancing steadily and that the good ore recently found by this work is persisting. Increased storage facilities underground have been completed and will obviate any serious delay in the future such as was caused by the recent car shortage.

At the Virginia-Louise property development work is being done on the 1st, 2nd and 5th levels. The drift or cross-cut on the 1st level, which recently struck the Great Western fault, was stopped and a new drift started on the ore along the fault to determine its direction. The average tonnage is being shipped, coming principally from the Davidson bed, a smaller amount coming from the 20-ft. or carbonate bed. Work has begun on new ore bins to provide additional storage. The regular annual stockholders meeting will be in February.

Earle Brodie, who holds a lease on the Meridian mine from the Amalgamated Pioche Mines & Smelters Corp., recently struck high-grade silver-lead ore in the 600-level drift at the Meridian shaft which is close to the Meadow Valley summit. A raise will be run from the drift to the surface to permit more economical handling.

Byron and Carter Hames are actively engaged in developing the Currency mine.

Arthur Murphy, lessee of the Ida-May mine, has installed new hoisting equipment and resumption of shipments is anticipated. The development of the mine at depth is planned.

The Lake Valley Mining Co. is making shipments of high-grade silver ore from its property near Geyser, fifty miles north of Pioche.

CANADA

British Columbia

Trail—Additions are being made and some remodeling is under way at the Trail smelter of the Consolidated Mining & Smelting Co. A supplementary drafting office is being provided for the use of a staff of about twelve draftsmen who will be engaged in connection with the new concentrating plant which, it is expected, will be erected at Rossland. As far as can be learned, the site of this mill has not been definitely decided as yet, there still being a possibility that it will be placed at Trail, owing to the difficulty of obtaining a satisfactory water supply at Rossland.

Kamloops—Application for the extension of the charter of the Kettle Valley Ry. to permit of the construction of a branch line into the Aspen Grove mining properties, which are now under development, is being made at Ottawa. The same railway company is applying for authority to build a branch to tap the Coalmont coal mines. The latter have been operated on a small scale recently. The output is being transported by motor truck to railhead. With railway connection no doubt the production will be increased.

MEXICO

Northern Sonora

Nacozari—New work will be undertaken by the Canario Copper Co. as a result of a recent visit of stockholders accompanied by James P. Harvey, president and managing director, and George F. Shurtleff, of New York, consulting engineer. A tunnel, 4,000 ft. long, which will gain about 700 ft. in depth, will be run from the Nacozari side of the hill to tap the workings on the Lilly Segundo property, in which a large disseminated orebody has been opened. The tunnel will make the Nacozari railroad easily available. It is also planned to put down a new double compartment shaft between 600 and 700 ft. south of the present one, which will play an important part in development work but probably will be turned later into an airshaft for underground ventilation. The ore being developed in the Lilly Segundo is less refractory than the Pilares ore, being chalcocite without chalcopyrite.

P. G. Beckett, general manager of the Phelps Dodge Corporation, who visited Nacozari for the first time on Jan. 23, addressed a mass meeting of employees, urging upon them a policy of "strict economy in all departments, and curtailment, if not elimination, of non-essentials until the copper situation has improved." Mr. Beckett revealed sidelights on the market situation and emphasized the necessity for lowering costs, even though the working force was handicapped by reduced production. H. T. Hamilton, manager, also spoke briefly along the same line. Mr. Beckett made a complete inspection of the properties before returning to his headquarters at Douglas, Ariz.

MEN THAT YOU SHOULD KNOW ABOUT

Charles F. Rand, who has been president of the United Engineering Society since 1917, has retired from that office, his term having expired. By constitutional limitation he was not eligible for re-election. During Mr. Rand's period of service the following interesting events took place: The mortgage debt was paid off; Engineering Foundation was established; the Library Service Bureau was made effective; an endowment of $100,000 was secured for the library; the libraries were consolidated under the library agreement; the American Society of Civil Engineers became an additional founder society; three stories were added to the building; Engineering Council came into existence; depreciation and reserve funds were set up and now amount to $110,199; and the net assets of the society were increased from $1,600,000 to $2,468,000, a gain of $868,000. As an appreciation of Mr. Rand's services the board of directors of the American Society of Mechanical Engineers presented him with engrossed resolutions.

John Gillie, manager of mines for the Anaconda Copper Mining Co., is in New York.

H. S. Mulliken is on a professional trip to Arizona and California and will return East in February.

F. K. Brunton has recently taken charge of the La Prieta mill, near Culiacan, Sinoloa, Mexico.

Albert C. Savage, of the Esperanza Mining Co., El Oro, Mexico, was in New York City on Jan. 22, 1920.

J. Vipond Davies has been elected president of the United Engineering Society, succeeding Charles F. Rand.

George M. Taylor, of Colorado Springs, has been elected president of the Colorado Metal Mining Association.

George E. Collins, of Denver, has been elected governor of the Colorado Chapter of the American Mining Congress.

Fayette A. Jones, of Albuquerque, N. M., will sail early in February for Central and South America on professional business.

Harvey B. Small sailed for Mangangue, Colombia, South America, on Feb. 3 to look after his mining interests there.

James Phillips, of New York, has been in Ajo, Ariz., inspecting the New Cornelia property in his capacity of director of the company.

M. F. Quinn, of Douglas, Ariz., has gone to Nacozari, Sonora, Mexico, on professional work. He will make an extended stay there.

H. B. Obert, of the Minnesota Mines Commission, has been inspecting property in the Hanover district, Grant County, New Mexico.

B. B. Thayer, vice-president of the Anaconda Copper Mining Co., sailed for South America on Jan. 31, to inspect the company's properties.

R. W. Mumford has accepted the position of chemical engineer in charge of development at the American Trona Corporation plant at Searles Lake, Cal.

H. S. Emlaw has been appointed general manager of the American Trona Corporation in California, and **Frederick Vieweg,** assistant general manager.

H. W. Morse has resigned as technical manager of the American Trona Corporation, and has accepted the position of consulting physical chemist to the company.

George Otis Smith, Director of U. S. Geological Survey, addressed the Engineers' Club of Philadelphia on Jan. 20. His subject was "Engineering as Prosperity Insurance."

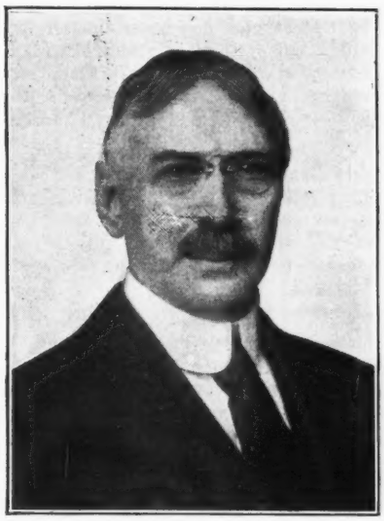


Photo by Ira L. Hill
CHARLES F. RAND

Edward Hoops, secretary, and **Basil Prescott,** manager, of the Last Chance mine at Lordsburg, N. M., are in the East on matters in connection with the larger development of that property.

H. V. Winchell, president of the American Institute of Mining & Metallurgical Engineers, was the honored guest at a banquet in Kingman, Ariz., given by the mining engineers of Mohave County.

Charles Kerr, of the milling department of the Miami Copper Co., left Miami, Ariz., on Jan. 10, for Santa Barbara, Chihuahua. He will be connected with the American Smelting & Refining Co.

Dexter S. Kimball, dean of the college of engineering, Cornell University, spent a few days in Butte, Mont., recently and addressed a joint meeting of Montana Society of Engineers and the American Society of Mechanical Engineers. From 1896 to 1898 Professor Kimball was connected with the Anaconda Copper Mining Co., and on this occasion revisited some of its leading properties.

G. M. Butler, president of the Southwestern District of the American Association of Engineers, addressed a meeting of engineers at Bisbee, Ariz., on Jan. 22, following which the Bisbee Chapter of the association was organized.

G. M. Butler, dean of engineering at University of Arizona, Tucson, was elected president of the Southwestern district of the American Association of Engineers on Jan. 10, 1920. Dean Butler addressed the section on the points to be considered before drafting an engineer-license bill.

George Gmahling, a well-known smelter construction foreman, with a half dozen picked workmen from Douglas and a number from other Arizona camps, sailed from New York for Peru on Jan. 31. The party will work under A. G. McGregor on the erection of reduction works by the Hagan Copper Syndicate, of New York.

Glenville A. Collins has resumed consulting engineering practice, with headquarters at 1316 L. C. Smith Building, Seattle, Wash., and with branch offices at Portland, Ore., Tokio, and Shanghai. Attention will be given to the general practice of mining and civil and mechanical engineering, as well as material-handling problems. Mr. Collins has been Northwestern manager for several years for the Wellman-Seaver-Morgan Co.

Oliver C. Ralston, formerly chemist with the U. S. Bureau of Mines Experiment Station at Salt Lake City, has re-entered the employ of the Bureau as superintendent of the station at Seattle, Wash. Mr. Ralston has been with an electrochemical company at Niagara Falls, N. Y., developing an ore-treating process. The Seattle station specializes in electro-metallurgical problems, and he therefore will be able to continue work in his own specialty.

OBITUARY

John S. Strode, a miner, for fifty years a resident of Shasta County, Cal., died Jan. 15, of pneumonia at the age of seventy-two years. In partnership with his brother, George C. Strode, he owned the Strode Mine, near Carrville, for twenty years.

D. C. Bard, a well-known mining expert and a graduate of Harvard University, died recently in Butte from influenza followed by pneumonia. Mr. Bard was forty-one years old. He was at one time connected with the faculty of the Montana School of Mines, and afterward moved to Seattle, where he opened an office. He had been in Butte to do some work in connection with the litigation between the Elm Orlu and Butte & Superior companies. In the suit between these companies last summer he was one of the leading expert witnesses for the former. Mr. Bard is survived by his widow.

Malcolm M. Thompson, geologist for the Carter Oil Co. and the Standard Oil Co. of New Jersey, died recently of pneumonia. He was born in New York City, and was graduated from the Columbia University School of Mines with the class of 1909. Mr. Thompson had traveled extensively in Central America and South America, and became a specialist in the examination of oil-producing properties. Before associating himself with the oil industry eight years ago, Mr. Thompson visited Chile for the Guggenheim Exploration Co. in connection with prospecting work that led to the formation of the Chile Copper Co.

John H. McChrystal died at the age of fifty-seven, of pneumonia, on the evening of Jan. 27, at Eureka, Utah, where for a number of years he had been manager of the Gemini Eureka Mines, Ridge & Valley, and Godiva mines. Mr. McChrystal, who was born at Franklin, Mich., went to Utah as a boy with his family in 1875, completing his education in that state, and entering the profession of mining in which he early became successful. Mr. McChrystal was a member of the American Institute of Mining & Metallurgical Engineers, the Salt Lake Commercial Club, and of other clubs and organizations. His immediate family surviving him are his widow, a son, Capt. Arthur J. McChrystal, in the United States service, and two daughters.

E. Fred Wood, formerly vice-president of the International Nickel Co., died suddenly at New York City on Jan. 5, in his sixty-second year. Mr. Wood was born in Milwaukee and was educated in the public schools of that city, later entering the University of Michigan. After leaving college Mr. Wood devoted himself assiduously to the study of metallurgy, and in connection with his studies made extensive trips through the various mining camps of the West. He later entered the employ of the Carnegie Steel Co., and rapidly rose to the position of assistant general superintendent of the Homestead plant, which position he filled for a number of years. During the period of the big strike at the plant, when Mr. Frick was shot, Mr. Wood was in entire charge of the plant. He was regarded by Mr. Carnegie and his associates as one of the valuable men of the organization and was one of the so-called "Carnegie Veteran Associates." When the International Nickel Co., was organized, Mr. Wood became its first vice-president and a member of the board of directors and of its executive committee. He was an important factor in developing the mining, smelting, and refining business of the company. When the United States entered the Great War, Mr. Wood resigned his official connection with the International Nickel Co. to devote himself to public work, and became a member of the committee on production of the War Industries Board. Mr. Wood served continuously on this board during the war, without compensation.

INDUSTRIAL NEWS

H. K. Porter Co. announces the death of its treasurer, Willis E. Martin, on Jan. 12 after a prolonged illness.

Fairbanks Co., Pittsburgh, Pa., will be represented in southern Ohio by A. S. Winter, who has joined its sales force. Mr. Winter was formerly advertising and sales manager for the William Powell Company.

Reading Engineering Co., Inc., 154 Nassau St., New York City, announces that it now has associated with it as vice-president Huntington Choate Atwater, recently resident engineer for the contractor at the Kensico dam.

Sullivan Machinery Co. announces that its former manager at New York, A. E. Blackwood, has been elected vice-president in charge of finance and accounting, and that H. T. Walsh, vice-president, will be in charge of sales. F. K. Copeland, president, will manage foreign sales.

Ohio Brass Co. announces that W. J. Stanton has accepted a position with the company. Mr. Stanton has been identified with the electric industry for the last twenty years, having been with the General Electric Co. for a period of eighteen years in the testing, engineering and sales departments.

United Smelting & Aluminum Co., Inc., of New Haven, Conn., announces the election of Frederick A. Merliss as vice-president and his appointment as manager of sales. Mr. Merliss has been connected with the company for the last three years as assistant secretary, and his new appointment fills the place left vacant through the resignation of L. M. Brile, former vice-president and sales manager.

New Jersey Zinc Co. will build additional zinc-oxide and lithopone plants to meet the rapidly growing demand for these products, these plants to be situated at strategic geographical points so as best to serve the company's customers in various parts of the country. Construction will begin immediately on zinc oxide and lithopone plants in Colorado and Pennsylvania. The ore supply for this increased production has already been provided.

Westinghouse Electric & Manufacturing Co. has announced the following promotions among its officials at East Pittsburgh: Alexander Taylor, for many years manager of works, has been made assistant to the vice-president in general charge in all plants of production, stocks, and general stores; R. L. Wilson has been promoted from general superintendent to works manager of the East Pittsburgh works; E. R. Norris has been appointed director of works equipment, in charge of machinery, tools, and methods in the various plants; C. B. Auel is made manager, employees' service department.

NEW PATENTS

Flotation Apparatus and Process. William L. Ziegler. (1,324,139; Dec. 9, 1919.)

Greensand—Cementing Material Obtained from Greensand. Harry W. Charlton, assignor to American Potash Corpn. (1,327,145; Jan. 6, 1920.)

Jig. Guy H. Elmore. (1,327,537; Jan. 6, 1920.)

Jigs. Discharge-Controlling Means for Jigs. Ralph Foderaro and George W. Wilmot. (1,324,588; Dec. 9, 1919.)

Manganese-Silver Ores, Treating. Leslie W. Austin. (1,327,974; Jan. 13, 1920.)

Mining-Car Wheel. Alfred Bryant Day. (1,326,649; Dec. 30, 1919.)

Oil and Gas—Apparatus for Separating Oil and Gas Direct from Wells. Albert M. Ballard, assignor to Sun Co. (1,327,691; Jan. 13, 1920.)

Oxidation of Molten Metal, Method of Preventing. Frederick F. McIntosh. (1,324,458; Dec. 9, 1919.)

Potash—Process of Obtaining Combined Potassium from Greensand. Thomas C. Meadows, Mathias Hauber, Jr. and Harry W. Charlton. (1,327,164; Jan. 6, 1920.)

Potassium—Process of Extracting, from Potash-Bearing Silicate Minerals. Samuel R. Scholes and Ralph F. Brenner. (1,327,781; Jan. 13, 1920.)

Pump for Mines. Herman August Herpst. (1,327,868; Jan. 13, 1920.)

Riffles—Gold-Saving Device. William D. Bludworth. (1,327,854; Jan. 13, 1920.)

Rolling Mill—Apparatus for Manipulation of Metal Ingots and the Like. Evan Walter Davies. (1,327,315; Jan. 6, 1920.)

Separator — Metal-Separator. Ambrose D. Fish. (1,327,667; Jan. 13, 1920.)

Steel Ingots, Process for Casting. Ray G. Coates. (1,327,987; Jan. 13, 1920.)

Sulphides—Process of Oxidation of Sulphides. George N. Libby. (1,323,-879; Dec. 2, 1919.)

Sulphur—Apparatus for Sulphur-Mining. Robert E. Carmichael. (1,-324,301; Dec. 9, 1919.)

Tungsten Powder, Means for Compressing. Carl A. Pfanstiehl. (1,326,-614; Dec. 30, 1919.)

Wells—Combination Well-Packer and Setting-Tool. Jamie Abercrombie and Nesbit M. Duncan. (1,327,077; Jan. 6, 1920.)

Well-Drilling, Combination Rig for. Jesse A. Morrison. (1,327,403; Jan. 6, 1920.)

Well Boring—Rotary Boring-Drill. Howard R. Hughes (1,327,913; Jan. 13, 1920.)

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices, Metal Market Conditions, Average Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Jan.	Sterling Exchange	Silver		Feb.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
29	353	135½	85	2	349	134⅛	84⅜
30	349¼	134¼	84⅛	3	337	133¼	86
31	349¾	133	83	4	325¼	132¾	88¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

Jan. Feb.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
29	18.65@18.85	60½	60½	8.50@8.60	8.25@8.35	8.90@9.00
30	18.65@18.85	59⅜@59¾	60¼	8.50@8.60	8.30@8.35	8.85@8.95
31	18.65@18.85	59½	60¼	8.50@8.65	8.35	8.80@8.90
2	18.65@18.85	58⅜@59	59¾@60	8.50@8.70	8⅜	8.75@8.85
3	18.65@18.85	58¼	58½@59	8.50@8.70	8⅜	8.70@8.80
4	18.65@18.85	57⅜@57½	58½	8.50@8.75	8⅜@8.43	8.60@8.80

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Jan. Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
29	120	121½	123	384	384	47¼	47¾	59¾	61½
30	118⅞	119⅝	122½	383¼	383½	47¼	47¾	59½	61
31	....	....	....	....	....	....	....	....	....
2	119½	121¼	123½	384	384¼	47½	48	59⅞	61⅞
3	119	120½	124	386¼	386½	47¾	48¼	60	62
4	119	120¾	125	388½	388¾	48	48½	60½	62½

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

METAL MARKETS

New York, Feb. 4, 1920.

Monthly Average Prices for January

Copper:	
New York Electrolytic.....	18.918
London Standard.....	118.095
London Electrolytic.....	123.238
Lead:	
New York.....	8.561
St. Louis.....	8.300
London	47.095
Silver:	
New York.....	132.827
London	79.846
Zinc:	
New York.....	9.483
St. Louis.....	9.133
London	58.643
Tin:	
New York.....	61.596
London	376.512

In the metal market this week lead has been strong, copper quiet and firm, and zinc very weak.

Atlantic freight rates tend easier; Transpacific rates remain unchanged at $12 from Hongkong and Kobe to San Francisco.

Copper

The copper market is quiet. The large consumers, through the heavy buying in December and January (nearly half a million pounds in December and over 200,000 in January), have their requirements comfortably filled. The large producers are not pushing into the lesser market, which leaves the small producers and speculators in the center of the stage. Speculative buyers caught with February delivery and selling in considerable lots at 18¾, 18⅝, and even 18½c.; and the price of the large producers for spot and nearby is around 19c., and higher for forward delivery. There is little export business.

Copper Sheets—No change in nominal price of 29½c. per lb. set early in January. Wire 22½c. per lb.

Tin

Tin sold on a steadily declining market during the week. There has been little incentive to importation of the metal, because much of the tin sold was disposed of at prices ranging from 1 to 1½c. below the cost of delivering the metal from London or Singapore. Transactions have been light, and chiefly by speculators who acted under selling pressure.

During the week Straits tin was quoted at 60½c. on Jan. 29; 60¼c. on Jan. 30 and 31; 59¾@60c. on Feb. 2; 58½@59c. on Feb. 3, and 58½c. on Feb. 4.

On Feb. 2, 150 tons arrived from Australia; and on Feb. 3, 225 tons arrived from London.

Lead

The principal producers who came into the general market at their official price of 8½c. New York and largely dominated it, continued to do so for the early part of the last week; but in the latter part of the week outside selling became prominent, resulting in rising prices. The position of lead is very strong; unlike the other metals, it is not greatly unsettled by the decline of foreign exchange, due to the fact that domestic lead is not exported, but only bonded lead. There is not much lead available, and dealers expect a rise. We hear that some lead which had been exported to South America is being reimported and sold in New York.

Zinc

The zinc market is very weak. Refiners have waited for an increased demand from the European market. This has now arrived, but is more than offset by the decline in foreign exchange. On this subject dealers are still bearish. Nevertheless a good deal of American zinc was sold on the London market. Zinc at East St. Louis declined during the week steadily from our last quotations, touching 8.60@8.80c. today. The domestic market is quiet, consumers refraining from purchasing so long as the weak export market indicates falling prices. High-grade zinc is reported bringing a premium of ¼ to ½c. per lb., and a satisfactory business is being done.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots. Slightly higher prices for export. Unchanged.

Gold—Transvaal gold quoted in London yesterday at 120s. 10d., a higher premium than before; today it advanced

further to 125s. 9d. The par value is 77s. 10½d., making the latest premium over 60 per cent.

Foreign exchange continued to fall alarmingly. The pound sterling was quoted yesterday at $3.33, against a normal value of $4.86, and is still lower today. Francs fell to 14.48 to the dollar, against a parity of 5.18½. Italian lire fell to 17.42 to the dollar, a discount of over 200 per cent. Marks were down to 1.12c., Austrian kronen to .32c. Canadian exchange was at a discount of 13 per cent.

Silver—The silver market has advanced in London, counterbalancing to a large extent the decline in sterling rates. Exchange on London, having declined to 3.25½, has affected the market to the point of demoralization. London cables that the Empire of India has changed from a sterling and silver basis to a gold basis. The main feature is that gold in the future will be the standard of value in India; and silver will remain legal tender, with the fixed ratio of one rupee for 11.3 grains of fine gold.

Mexican dollars at New York: Jan. 29, 103⅛; Jan. 30, 103⅛; Jan. 31, 101⅞; Feb. 2, 103⅛; Feb. 3, 102½; Feb. 4, 102¼.

Platinum — $155 @ $150 per oz. Slightly easier, owing to Russian situation.

Palladium—$130@$140 per oz.

Iridium—Quoted nominally at $300.

Other Metals

Aluminum—Producers are asking 33c. per lb., but some small sales of virgin metal are reported under that figure.

Antimony—Demand continues good, and with short supplies price continues to creep up. Spot is quoted 11⅞@11½c. for ordinary grades. This price shaded ⅛@¼c. on futures.

Bismuth—Unchanged at $2.50 for 500-lb. lots.

Cadmium — Unchanged at $1.40 @ $1.50 per lb. Market quiet.

Nickel—Ingot, 43c.; shot, 43c; electrolytic, 45c. Unchanged.

Quicksilver—Collapse in foreign exchange made prices drop on Tuesday afternoon. Price now $80 for 75-lb. flask. San Francisco also $80.

Other Ores and Minerals

Chrome Ore—Few offers, and previous quotation of 75c. per unit for 50 per cent ore still reflects the market.

Manganese Ore — Domestic manganese ore containing 73 per cent MnO_2, about 1.11 per cent Fe, and less than 0.005 per cent Cu, is quoted at $35@$36 per gross ton f.o.b. Montana, or about $46@$47 f.o.b. New York. Manganese ore from the Caucasus, containing 83 to 85 per cent MnO_2, is quoted at $70@$75 per ton f.o.b. New York. A small tonnage is available at New York, Philadelphia, or Baltimore at about $70 a ton. On account of high freight rates and scarcity of cargo space, most Caucasian manganese ore goes to England, where there is a good demand. This ore will run not over 0.02 per cent Cu and not over 1.5 per cent Fe. Small quantities have arrived from Japan, running 85.14 per cent MnO_2, and low in iron, but too high in copper for ordinary commercial use, some of the material running as high as 0.07 per cent copper.

Molybdenum Ore—65c. per lb. MoS_2 nominal, for 90 per cent concentrate. Market extremely quiet.

Feldspar—$13.50 to $18 per ton, according to quality.

Fluorspar—Lump ore containing 85 per cent CaF_2 and not over 5 per cent SiO_2 is quoted unchanged at $16 f.o.b. mines at Tonuco, N. M. Washed gravel brings $17. Freight to Chicago, $7.50; to New York, $15.

Graphite—Ceylon grades are quoted unchanged: Lump, 15@16c.; chip, 11@12c.; dust, 8@9c. Domestic flake about 10c. per lb. Crude Mexican ore $34 per ton.

Nitrate—Unchanged at $3.70 per cwt. Supplies scarce.

Pyrites—Spanish pyrites is quoted at 16c. per unit for furnace-size ore, free from fines, c.i.f., Atlantic ports. Shipping scarce.

Sulphur—Prices average $18 per ton for domestic and $20 for export, f.o.b. Texas and Louisiana mines. Practically no change in past two or three months. Export demand fairly good.

Tungsten Ore—Sales of Chinese wolframite for week picked up somewhat at $5.50@$6. High-grade ore, $7. Nothing definite regarding tungsten tariff.

Zinc and Lead Ore Markets

Joplin, Mo., Jan. 31—Zinc blende, per ton, high, $58.50; basis 60 per cent zinc, premium, $57; Prime Western, $55; fines and slimes, $52.50@$50; calamine, basis 40 per cent zinc, $38@$40. Average settling prices: Blende, $56.59; calamine, $38; all zinc ores, $56.48.

Lead, high, $101.70; basis 80 per cent lead, $100; average settling price, all grades of lead, $97.83 per ton.

Shipments the week: Blende, 12,724; calamine, 67; lead, 1,473 tons. Value, all ores the week, $866,720.

Shipments the month: Blende, 49,965; calamine, 317; lead, 6,560 tons. Value, all ores the month, $3,331,930.

Several buyers were offering only $52.50 basis Prime Western today, but sales at that price could not be confirmed at 6 o'clock tonight. It is possible ore was purchased on that basis, the seller declining to acknowledge the transaction, for personal reasons.

One smelter has procured a number of cattle cars, cleaned and boxed them up, and is using them to and from the smelters, on a leased plan, it is reported. Coal cars are numerous, but not plentiful; but good box cars are seldom seen. The Eastern smelters dislike to use other than box cars, and shipments are short to Pennsylvania points. A strike of smelter employes at Depew, Ill., also lessens shipments.

Platteville, Wis., Jan. 31—No sales of premium or Prime Western grades blende were made this week. The small tonnage available was not offered for sale in the open market, and several buyers, on the other hand, remained throughout the week without buying instructions. Lead ore, basis 80 per cent lead, $100 per ton. Shipments reported for the week are 1,138 tons blende, 40 tons lead and 30 tons sulphur ore. For the year to date the totals are blende, 7,544; calamine, 360; lead, 705; sulphur ore, 30 tons. During the week 2,072 tons blende was shipped to separating plants.

Iron Trade Review

Pittsburgh, Feb. 2, 1920

Finished-Steel — Prices range from $10 to $60 per ton above March 21 level. Plates, 3.25@3.75c; bars, 3.50@4c.

Steel—Prices are extremely irregular. For instance, one producer has sold a round tonnage of sheet bars at $65 and another has sold at $56, the circumstances being less dissimilar than the prices. Small billets have brought $60. Slabs could hardly be bought under $55 or $60. The market shows that steel-producing capacity has not outrun finishing capacity, as thought in some quarters, by reason of the new construction during the war.

Pig Iron—Prices are higher again, and the only definite market is for second-half delivery, prompt lots being hardly obtainable at any price. The market for extended delivery is now clear cut, as follows: Bessemer, $41; basic and foundry, $40; malleable, $41.25; forge, $39.25, f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh, but furnaces that have been selling at these prices state they are merely accumulating some backlog business, and thus further advances may occur at any moment.

Coke—The market remains quiet, on account of practically the entire production going out on regular contracts, or on general understandings that shipments are to be made and billed at the Government prices. Many producers are unwilling to adjust invoice prices on shipments made against contracts to the Government limits, although the regulations seem clear on this point. We quote furnace coke at $6 and foundry at $7, per net ton at ovens, Connellsville region.

Ferromanganese — Advances have been running at close to $10 a week, the latest quotation of domestic producers being $160, delivered, for 76 to 80 per cent. English is said to be available in limited tonnages at $150 c.i.f. Spiegeleisen is quoted at $57.50, furnace, for future, with no regular quotations for spot.

Ferrosilicon—Electrolytic ferrosilicon remains at $80 for 50 per cent and $140 for 75 per cent, delivered Pittsburgh, Valleys, and Cleveland. Bessemer ferrosilicon is held by most producers at $59.50 for 10 per cent, $62.80 for 11 per cent, and $66.10 for 12 per cent, but some producers seem to be out of the market.

MINING STOCKS

Week Ended Jan. 31, 1920

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Adventure	Boston	*99	*99	*99		
Ahmeek	Boston	74	72	72	Dec. '19,	$1.00
Alaska, B. C.	N. Y. Curb	1	⅞	1		
Algomah	Boston			†*40		
Allouez	Boston	39	37½	37½	Mar. '19,	1.00
Anaconda	N. Y.	62¾	61	61¾	Nov. '19,	1.00
Ariz. Com	Boston	14	14	14	Oct. '18,	.50
Big Ledge	N. Y. Curb	⅛	7/16	⅛		
Bingham Mines	Boston	7	7	7	Sept. '19,	.25
Boston & Ely	Boston Curb					
Butte & Bal	Boston	*40	*40	*40		
Butte & Lond	Boston Curb			*12		
Calaveras	Boston Curb			1		
Calumet & Ariz	Boston	66	64	64	Dec. '19,	.50
Calumet & Hecla	Boston	395	390	390	Dec. '19,	5.00
Calumet & Jerome	N. Y. Curb			†*10		
Can. Copper	N. Y. Curb	1 7/16	1 7/16	1 7/16		
Centennial	Boston	15½	15½	15½	Dec. '18,	1.00
Cerro de Pasco	N. Y.	57½	55	55½	Dec. '19,	1.00
Con. Ariz	N. Y. Curb	⅛	1/16	⅛	Dec. '18,	.05
Con. Copper M	N. Y. Curb	4⅞	4⅞	4⅞		
Chile Cop	N. Y.	19¼	18⅞	18⅞		
Chino	N. Y.	38¼	36¼	37¼	Dec. '19,	.75
Cliff	Boston					
Cop. Range	Boston	47	45½	46	Dec. '19,	.50
Crystal (old)	Boston Curb			*9		
Crystal Cop	Boston Curb			*33		
Daly-West	Boston	4¼	3¾	4		
Davis-Daly	Boston	12½	11½	12½	Dec. '19,	.50
East Butte	Boston	14¼	14¼	14¼	Dec. '19,	.50
First Nat'l	Boston Curb			1½	Feb. '19,	.15
Franklin	Boston	3¼	3¼	3¼		
Granby	N. Y.	49	48	48	May '19,	1.25
Greene-Can	N. Y.	36	35½	36	Feb. '19,	1.50
Hancock	Boston	5¼	5¼	5¼		
Helvetia	Boston	3¼	3¼	3¼		
Houghton	Boston Curb			⅜		
Howe Sound	N. Y. Curb			†3½	Jan. '20,	.05
Inspiration	N. Y.	57⅜	55½	56½	Jan. '20,	1.50
Indiana	Boston			†*50		
Iron Cap	Boston Curb			11	Feb. '19,	.25
Isle Royale	Boston	35½	34	34	Sept. '19,	.50
Jerome Verde	N. Y. Curb			†⅞		
Kennecott	N. Y.	31	30½	30½	Dec. '19,	.50
Keweenaw	Boston			†1⅛		
Lake Copper	Boston	4½	4½	4½		
La Salle	Boston			†3		
Magma Chief	N. Y. Curb	⅜	⅜	⅜		
Magma Copper	N. Y. Curb			†32	Jan. '19,	.50
Majestic	Boston Curb			*18		
Mason Valley	N. Y. Curb	3	3	3		
Mass Con.	Boston			†5⅜	Nov. '17,	1.00
Mayflower	Boston	8¾	8	8¾		
Miami	N. Y.	24⅜	23¾	24	Nov. '19,	.50
Michigan	Boston	7½	5⅜	7		
Mohawk	N. Y. Curb	68½	67⅞	67⅞	Nov. '19,	1.00
Mother Lode(New)	N. Y. Curb	5¾	5⅜	5¾		
Nev. Con	N. Y.	16¼	16	16	Dec. '19,	.37½
Nixon Nev	N. Y. Curb	*18	*15	*18		
Nev. Douglas	Boston Curb			*12		
New Arcadian	Boston	4¼	4	4¼		
New Baltic	Boston Curb			3¾		
New Cornelia	Boston	21½	21¼	21⅜	Nov. '18,	.25
North Butte	Boston	17¼	16	16½	Oct. '18,	.25
North Lake	Boston	*85	*80	*80		
Ohio Copper	N. Y. Curb			†*25		
Oneco	Boston Curb			*60		
Ojibway	Boston	2⅜	2⅛	2⅜		
Old Dominion	Boston	36	35	35½	Dec. '18,	1.00
Osceola	Boston	52	51	52	Dec. '19,	1.00
Quincy	Boston	62	60	60½	Dec. '19,	1.00
Ray Hercules	N. Y. Curb	2⅛	1⅞	1⅞		
Ray Con	N. Y.	21½	20⅝	20⅝	Dec. '19,	.50
Seneca	Boston	19	16½	16½		
St. Mary's M. L.	Boston	55½	53	53	Dec. '19,	2.00
Shannon	Boston			†1⅜	Nov. '17,	.25
South Lake	Boston			†1¼		
South Utah	Boston			†*18		
Shattuck Ariz	N. Y.	12⅜	12⅜	12⅜	Jan. '20,	.25
Superior	Boston	5⅜	5	5	Apr. '17,	1.00
Superior & Boston	Boston	6¼	4⅞	5⅛		
Tenn. C & C	N. Y.	12	11¼	11¼	May '18,	1.00
Trinity	Boston	2	2	2		
Tuolumne	Boston	1⅛	1	1⅛		
United Verd. Ex	Boston Curb			41	Nov. '19,	1.50
Utah Cop	N. Y.	76¼	74⅛	74⅛	Dec. '19,	1.50
Utah Con	Boston	9¼	9	9⅛	Sept. '18,	.25
Utah M. & T	Boston	2¼	2⅛	2⅛	Dec. '17,	.30
Victoria	Boston	3	3	3		
Winona	Boston	1⅛	1⅛	1⅛		
Wolverine	Boston	21	20½	21	Jan. '20,	.50
LEAD						
Hecla	N. Y. Curb	4⅜	2	4½	Dec. '19,	.15
St. Joe Lead	N. Y.	16	15¾	16	Dec. '19,	.25
Stewart	Boston Curb			*15	Dec. '15,	.05
Utah Apex	Boston	2⅛	2⅛	2⅛	Nov. '18,	.25

*Cents per share. † Bid price on Jan. 31

Stock	Exch.	High	Low	Last	Last	Div.
ZINC						
Am. Z. L. & S	N. Y.	20⅛	18	18⅜	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	58½	58½	58½	Feb. '20,	1.50
Butte C. & Z	N. Y.	10	9½	9½	Jul. '18,	.50
Butte & N. Y.	N. Y. Curb			⅜		
Butte & Superior	N. Y.	28½	25⅞	25⅞	Sept. '17,	1.25
Natl. Z. & L.	Boston Curb			*7	May '17,	.02
Success	N. Y. Curb	*6	*3	*4	July '16,	.03
GOLD						
Alaska Gold	N. Y.	1⅞	1⅞	1⅞		
Alaska Juneau	N. Y.	2	2	2		
Booth	N. Y. Curb	*6	*5	*6		
Carson Hill	N. Y. Curb	31½	28	29		
Cresson Gold	N. Y. Curb	2½	2¼	2¼	Dec. '19,	.10
Dome Ex	Toronto			*30		
Dome Lake	Toronto			*14		
Dome Mines	N. Y.	12½	12¼	12¼	Jan. '20,	.25
Goldfield Con	N. Y. Curb	*14	*11	*12	Dec. '19,	.05
Hedley	Boston				Jun. '19,	.10
Hollinger	Toronto			6.90	Dec. '19,	.05
Homestake	N. Y.	60½	60	60	Sept. '19,	.50
Kewanas	N. Y. Curb	*3	*1⅛	*3		
McIntyre Porcupine	Toronto			2.07	Jan. '20	.05
Silver Pick	N. Y. Curb	*7	*3	*6		
Teck-Hughes	Toronto			*19		
United Eastern	N. Y. Curb	4 1/16	3 15/16	4	Jan. '20,	.21
West Dome	Toronto			*9		
White Caps	N. Y. Curb	*12	*10½	*12		
Yukon Gold	Boston Curb			*1⅛	June '18,	.02½
SILVER						
Adanac	Toronto			*5⅛		
Bailey	Toronto			*5	Apr. '16,	.05
Beaver Con	Toronto			*67		
Coniagas	Toronto			3	Nov. '19,	.12½
Crown Reserve	Toronto			*40	Jan. '17,	.05
Hargraves	Toronto			*3		
Kerr Lake	Boston	4¼	4¼	4¼	Sept. '19,	1.00
La Rose	N. Y. Curb			†*35	Apr. '18,	.02
McKinley-Dar	N. Y. Curb	*65	*64	*65	Jan. '20,	.03
Nipissing	N. Y. Curb	11⅜	11⅛	11⅛	Jan. '20,	.50
Ontario Silver	N. Y.	9⅛	8⅞	8⅞	Jan. '19,	.50
Ophir Silver	N. Y. Curb	1⅛	1⅛	1⅛		
Peterson Lake	Toronto			*22	Jan. '17,	.01½
Sil. King Ariz	N. Y. Curb	¼	⅛	⅛		
Temiskaming	Toronto			*45	Jan. '20,	.04
Trethewey	Toronto			*47	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*3	*1⅛	*2⅛		
Batopilas	Boston					
Bost. & Mont	N. Y. Curb	*74	*72	*74		
Cashboy	N. Y. Curb	*10	*8⅛	*9		
El Salvador	N. Y. Curb	3½	3	3⅛		
Goldfield Merger	N. Y. Curb	*4	*3	*3		
Jim Butler	N. Y. Curb	*27	*24	*26	Aug. '18,	.07
Jumbo Extension	N. Y. Curb	*7⅛	*6	*7	June '16,	.05
Louisiana	N. Y. Curb	⅛	⅛	⅛		
MacNamara	N. Y. Curb	⅛	⅛	⅛		
Nev. Packard	Boston Curb				Apr. '19,	.02
Rochester Mines	N. Y. Curb			†*15	Oct. '18,	.02
Tonopah-Belmont	N. Y. Curb	3	2⅛	3	Jan. '20,	.05
Tonopah Ex	N. Y. Curb	2⅛	2⅛	2⅛	Jan. '20,	.05
Tonopah Mining	N. Y. Curb	2⅛	2⅛	2⅛	Oct. '19,	.15
West End Con	N. Y. Curb	2 1/16	1 15/16	1⅛	Dec. '19,	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*39	*38	*38	Jan. '20,	.01
Fed. M. & S.	N. Y.	13⅜	12	13⅜	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	33⅛	31	32⅛	Dec. '19,	.50
Iron Blossom	N. Y. Curb			†⅛	Jan. '20,	.02½
Marsh Mines	N. Y. Curb	*24	*22	*24		
Rex Con	N. Y. Curb	*9	*7	*8		
Simon S. L.	N. Y. Curb			†1		
Stand. S. L.	N. Y. Curb	⅜	5/16	⅜	Oct. '17,	.05
Wilbert	N. Y. Curb	*7	*6	*7	Nov. '17,	.10
NICKEL-COPPER						
Internat'l Nickel	N. Y.	25⅛	24	24	Mar. '19,	.50
Internat'l Nick. pf.	N. Y.			90	Feb. '20,	1.50
QUICKSILVER						
New Idria	Boston				Jan. '19,	.25
MANGANESE						
Man. M. of Am.	N. Y. Curb					
TUNGSTEN						
Mojave Tungsten	Boston Curb			*10		
VANADIUM						
Vanadium Corpn.	N. Y.	53½	47	51½		
GOLD AND PLATINUM						
So. Am. G. & P.	N. Y. Curb	8¼	8	8		
MINING, SMELTING AND REFINING						
A. S. & R.	N. Y.	69¾	67½	68¾	Dec. '19,	1.00
A. S. & R., pf	N. Y.	99½	98	98	Dec. '19,	1.75
Am. Sm. pf., A	N. Y.	81½	81½	81½	Jan. '20,	1.50
U. S. Sm. R. & M.	N. Y.	72	69½	71	Jan. '20,	1.50
U. S. Sm. R. & M., pf	N. Y.	47¾	46¼	46¼	Jan. '20,	.87½
Natl. Lead	N. Y.	86¼	82	82	Dec. '19,	1.25¼
Natl. Lead, pf	N. Y.	109	108½	109	Dec. '19,	1.75

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